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**EXTRATERRESTRIAL FLOOD
IMPACTS AND THE ICE AGE**

**FINGERNAILS—DESIGNED
OR EVOLUTIONARY RELICS?**

NOAH AND THE FLOOD in ANCIENT EGYPT

**UNTANGLING CRYPTIC
BIRD FAMILIES**

**THOMAS MALTHUS
EUGENICS AND ABORTION**



JOURNAL OF CREATION

An international journal devoted to the presentation and discussion of technical aspects of the sciences such as geology, biology, astronomy, etc., and also geography, archaeology, biblical history, philosophy, etc., as they relate to the study of biblical creation and Noah's Flood.

COVER: The gold death mask of pharaoh Tutankhamun

IMAGE: Jaroslav Moravcik © 123RF.com

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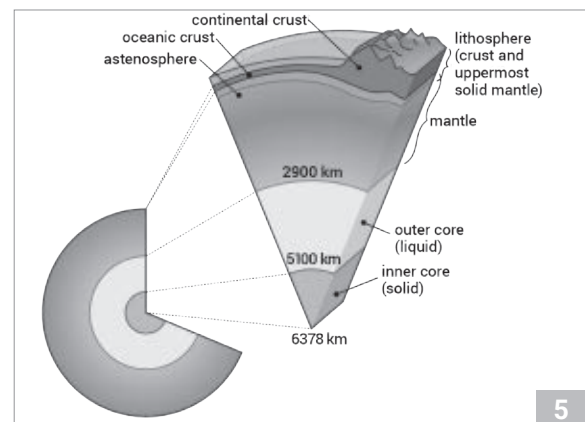
- 3** More expansion of fossil time ranges
» Michael J. Oard
- 5** Problems with the naturalistic formation of Earth's inner core
» Michael J. Oard
- 7** Glacial-like striations formed in less than 90 seconds
» Michael J. Oard
- 8** South Caspian Basin supports a late Cenozoic Flood boundary
» Timothy L. Clarey and Davis J. Werner
- 11** Fingernails and toenails—useless evolutionary relics or an important part of design?
» Jerry Bergman

BOOK REVIEWS

- 14** Keen insights into Genesis 1–3 flawed by analogical days approach
» Keaton Halley
» *Interpreting Eden: A guide to faithfully reading and understanding Genesis 1–3*
(Vern S. Poythress)
- 18** Orthodox on God; ambivalent on biblical literalism; bypassing science; socially conservative
» John Woodmorappe
» *Genesis: God, Creation, and destruction*
(Dennis Prager)
- 22** Healing division or courting heresy?
» Gavin Cox
» *The Fool and the Heretic: How two scientists moved beyond labels to a Christian dialogue about creation and evolution*
(Todd Charles Wood and Darrel R. Falk)
- 26** Debunks many science-related historical myths that demean the Christian faith
» John Woodmorappe
» *Unbelievable: 7 myths about the history and future of science and religion*
(Michael Newton Keas)

(Book Reviews continued)

- 31** Darwinists still trying to refute Behe and still failing
» Jerry Bergman
» *Darwin Devolves: The new science about DNA that challenges evolution*
(Michael Behe)
- 36** Systematic theology with a solid foundation
» Cody J. Guitard
» *Biblical Doctrine: A systematic summary of Bible truth*
(John MacArthur and Richard Mayhue (Eds.))
- 40** A biased survey of the history of Genesis interpretation
» Lita Cosner
» *Since the Beginning: Interpreting Genesis 1 and 2 through the ages*
(Kyle Greenwood (Ed.))
- 43** Does 'race' science refute superior humans?
» Lucien Tuinstra
» *Superior: The return of race science*
(Angela Saini)



Can naturalism explain why Earth has a solid core and a geomagnetic field?

LETTERS

- 46** Salt deposits
» W.R. Barnhart
» REPLY: Stef Heerema and Gert-Jan van Heugten



PAPERS

- 49** Comparison of morphology-based and genomics-based baraminology methods
» Matthew Cserhati and Joel Tay
- 55** Baraminology data filtering method based on entropy measurement and its application in dinosaur and cephalopod data sets
» Matthew Cserhati
- 66** Baraminology suggests cryptic relationships among Caprimulgiformes
» Matthew Cserhati and Jon Alquist
- 77** Flood impacts reinforce volcanic cooling to start Ice Age
» Michael J. Oard
- 85** The Florissant redwood trees deposited from a Flood log mat
» Michael J. Oard



91

The vertical, petrified redwood stumps at Florissant Fossil Beds National Monument are consistent with their deposition from floating log mats during the Genesis Flood.

VIEWPOINT

- 94** The search for Noah and the Flood in ancient Egypt—part 1
» Gavin Cox
- 102** The search for Noah and the Flood in ancient Egypt—part 2
» Gavin Cox

ESSAYS

- 109** Common examples of 'one gene, one trait' exposed
» Jerry Bergman
- 115** The conventionality thesis and biblical creation
» John Harnett
- 122** Thomas Malthus's influence on the eugenics and abortion movements
» Jerry Bergman

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- » The account of origins presented in Genesis is a simple but factual presentation of actual

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- » Scripture teaches a recent origin for man and the whole creation.
- » The great Flood of Genesis was an actual historic event, worldwide (global) in its extent and effect.
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More expansion of fossil time ranges

Michael J. Oard

For more than 25 years, I have been reporting on the extension of fossil ranges either up or down within the geological column. Other creation scientists, such as Woodmorappe,¹ have also been reporting range extensions. I also have been reporting on new archaeological (SG) finds that post-Flood man was more sophisticated ‘earlier’ than evolutionary scientists presume.^{2,3} Sometimes these extensions are significant and other times minor. Although some general trends show up, the range extensions show that secular scientists do not know the exact time various organisms lived within their deep time worldview. They also do not know that the various types of post-Flood people were fully human from their first appearance. The last article I published on these subjects in the *Journal of Creation* was in 2017.⁴ In this article, I document more evidence that Neandertal man was a type of modern man and discuss the downward extension in the geological column of seven more organisms or organic structures. Regardless of when a fossil is found in the geological column, there still are no transitional fossils.

Early Neandertals more modern than thought

Scientists have discovered the remains of an annular construction 336 m within a cave in southwest France attributed to Neandertals, since they are supposed to have been the only humans around.⁵ They found a regular geometry of broken stalagmite circles with several traces of fire that was dated

by uranium-series to be 176.5 ka. This is the first evidence found displaying Neandertal’s construction ability and revealing a complex social network.⁶ Thus, “humans from this period had already mastered the underground environment which can be considered a major step in human modernity”.⁷ The authors also conclude:

“Until now no evidence has been found for regular Neanderthal incursions into caves, except for a possible case of footprints, and Neanderthal constructions inside caves, at least at a distance that is no longer exposed to daylight, were totally unknown.”⁸

This finding supports the other human abilities of Neandertals, including painting sophisticated images in caves⁹ and jewelry making.¹⁰

Algae with siliceous structures ‘evolved’ earlier

Chrysophytes are a diverse group of algae mainly found in freshwater. Their ‘oldest’ known representatives are found in the early Cretaceous, 110 Ma ago according to the evolutionary dating scheme. This group of algae commonly form siliceous (SiO₂) structures and was assumed to have evolved following the ‘great dying’ of the Permian/Triassic transition. Recently siliceous algae cyst fossils from chrysophytes have been discovered from Late Triassic ‘lacustrine’ (lake) strata from the Ordos Basin, China.¹¹ The cyst fossils were already highly diversified and dated about 230 Ma ago, suggesting that their ‘evolution’ occurred much earlier. This pushes chrysophytes back about 120 Ma, and the ‘molecular clock’ suggests their origin is in the Paleozoic. The molecular clock often suggests that fossils should be found earlier, but regardless pushing chrysophytes back 120 million evolutionary years still shows that the fossil record is broader than they earlier thought.

Unique bird vocal organ ‘originated’ earlier

Birds produce unique sounds from an organ called a ‘syrinx’. The oldest known syrinx was unofficially reported from the Eocene (about 40 Ma). Now a fossil syrinx has been found from the Late Cretaceous, about 66–69 Ma in the evolutionary scheme, on the Antarctica Peninsula.^{12,13} This pushes this unique vocal organ about 28 Ma back in the geological column.

Gliding mammals now pushed back into Jurassic

Sophisticated mammals have been pushed back into the Jurassic.¹⁴ A gliding mammal found in China was loosely dated as Late Jurassic or early Cretaceous.¹⁵ Secular scientists have now found a ‘securely dated’ gliding mammal dated as Late Jurassic, 160 Ma ago, from China.¹⁶ Gliding “requires considerable shoulder and forelimb maneuverability”.¹⁷ But some features of the sophisticated forelimb structure are claimed to have evolved several times in other mammals by ‘convergent evolution’.

Jellyfish fossils pushed back tens of millions of years

Scientists have discovered what they believe are the oldest jellyfish strandings in the Phanerozoic.¹⁸ This extends the record back tens of millions of years to the Early Cambrian. These secular scientists obviously do not accept Precambrian jellyfish fossils that have been found in Western Australia¹⁹ or South Australia,²⁰ although they admit other soft-bodied macrofauna are found in marine sandstones in the Neoproterozoic and early Paleozoic.²¹

Oldest evidence of trematode parasitism in bivalves

Trematodes are flatworms of the phylum platyhelminths. They are

parasites of mollusks and vertebrates. Researchers have recently found the oldest evidence of trematode parasitism of bivalves in the 76 Ma old Judith River Formation of Montana, USA. This parasite-host association was previously reported from Eocene (about 40 Ma ago) marine bivalves in Europe. Now the record has been pushed back 36 Ma into what is believed to be a freshwater ecosystem, since the Judith River Formation is famous for its dinosaur fossils.

Key plant groups pushed back tens of millions of years

Probably the most significant range extension is the discovery of the Permian fossils of Southern Hemisphere evergreen trees and bushes, the podocarps, in the Middle East of the Northern Hemisphere (figure 1).^{22,23} The earliest previous fossils were of Triassic age, and one was even assumed to be an ‘index fossil’ for the Triassic. The fossils are exquisitely preserved and survived the supposed ‘great dying’ of the ‘Permian extinction’. They push the fossil record of this group of living conifers back tens of millions of years.

Unique insect egg-hatching mechanism found in 130 Ma amber

Hatching from an egg is an important moment in the life of an animal that comes from an egg, but the mechanisms of breaking out of the egg

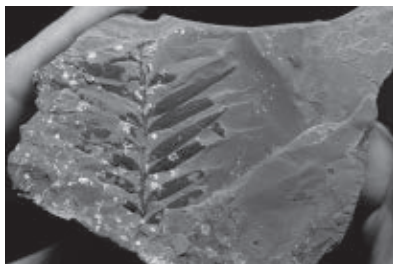


Figure 1. A podocarp shoot fragment previously thought to be from the Triassic is now found in the Permian (from Pennisi²³).

are diverse and complex. Of course, the fossil record of the evolution of any hatching mechanism is almost totally absent:

“However, the evolutionary processes by which hatching mechanisms and related embryonic structures became established in deep time are poorly understood due to a nearly complete absence from the fossil record.”²⁴

Now they have obtained multiple neonate (new-born) green lacewing larvae in 130-Ma-old Lebanese amber showing serrated blade egg busters that can split the eggshells. Moreover, this is the same or similar to mechanisms observed in modern lacewing larvae. And since several organisms possess this special egg-busting mechanism, the authors suggest that ‘convergent evolution’ was responsible. It is amazing how often evolutionists apply the magical convergent evolution to explain the independent evolution of similar features in organisms not closely related.

Conclusion

Critics ask creationists to explain the fossil record, but it is the evolutionists who have the problem. The precise fossil record is not yet available, and there could be some major changes in the future as a result of more discoveries. Many recent discoveries are awkward to explain from an evolutionary perspective, but are what is expected from a record deposited by the global Flood. Regarding the bird fossil syrinx, O’Connor states:

“But as we repeatedly find in the world of palaeontology, inferences derived from the fossil record are ephemeral entities lasting only until the next spectacular fossil is recovered.”²⁵

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Problems with the naturalistic formation of Earth's inner core

Michael J. Oard

Popular articles, books, and university classrooms regularly give the impression that secular science can explain the origin of the universe as well as the eventual origin of life and the complexity of life. The nebular hypothesis is their current hope for explaining the origin of the solar system. It postulates that the solar system was formed by the collapse of a gas and dust cloud. Rarely do you hear that there is a problem with the origin of dust and gas, with how these coagulated to form planetesimals, or with how these planetesimals supposedly grew large enough for gravity to take over their formation into planets. Numerous problems with details of the solar system are commonly swept away.¹ In fact, similar problems occur with the formation of stars, galaxies, non-solar system planetary bodies, asteroids, and comets.

The secular literature often reveals that researchers have difficulty with almost every presumed step. Yet, they paper over these difficulties by minimizing them, ignoring them, adding a secondary hypothesis, or telling us they are working on a solution. Few seem to question whether their fundamental assumptions may be wrong. This is puzzling until we realize the question of origins is largely a worldview issue. It is a matter of faith in the secular world that an exclusively material explanation of origins actually exists if they look hard enough.

Problems with the naturalistic origin of the solid inner core

In the nebular hypothesis, Earth eventually forms a core, mantle, and

crust (figure 1). The core begins as a liquid, with the inner core solidifying with time.² Huguet *et al.* give a simplified summary of the prevailing view of how the solid inner core formed:

“The conventional view of Earth’s inner core is that it began to crystallize at Earth’s center when the temperature dropped below the melting point of the iron alloy and has grown steadily since that time as the core continued to cool.”³

However, this explanation has at least one fundamental problem from a naturalistic point of view. For the inner core to solidify, the molecules have to pass through an energy of nucleation barrier before the first stable crystal nucleus can form.³ This means that during cooling, the liquid has to become highly supersaturated before the crystals can form either with a solid ‘seed’ of the same composition for homogeneous nucleation or a ‘seed’ of some other compound. Once crystals have formed, the solidification proceeds. This key step has been neglected:

“However, to our knowledge, no previous study has considered or evaluated quantitatively the

thermodynamic barrier to nucleation in Earth’s inner core, or its consequences for inner core formation and core evolution.”³

The process of mineral nucleation is very similar to the homogenous nucleation of ice crystals from rain drops.⁴ With few or no ice-forming particles within the clouds, water drops must cool to around -30°C to -40°C before ice can form. This is why water drops in deep convection (upward vertical velocity in thunderstorms) supercool to well below freezing. With some ice-forming particles, supercooling of the water drops could be below -10°C , perhaps even down to -30°C . Supercooled raindrops in clouds is why aircraft flying through clouds that are below freezing need to be concerned about icing on the aircraft wings and fuselage.

For the core of Earth to form the first crystals from a homogenous liquid, the temperature of the core near the centre of Earth must cool more than $1,000^{\circ}\text{C}$ below the liquidus temperature, which presents a major problem:

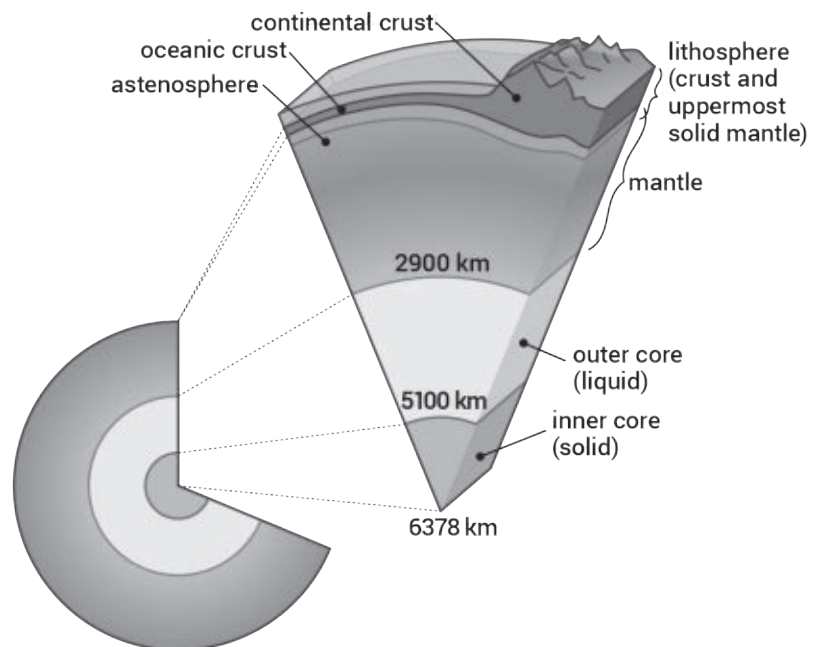


Figure 1. Schematic section of Earth's interior

“Using constraints from experiments, simulations, and theory, we show that spontaneous crystallization in a homogeneous liquid iron alloy at Earth’s core pressures requires a critical supercooling of order 1,000 K, which is too large to be a plausible mechanism for the origin of Earth’s inner core. ... yet the inner core exists: this is the nucleation paradox.”³

Attempted rescue by another hypothesis

Scientists regularly remain quiet about a paradox in their perspective until some researcher or group of researchers thinks they have a potential solution to the problem. The paradox of the naturalistic solidification of the inner core is a case in point. The researchers consider several mechanisms, all with caveats. They then look to the lower mantle for a solution:

“In the absence of a plausible internal mechanism for producing a substrate [for nucleation] that could substantially lower the nucleation barrier for solid iron near Earth’s center, it is necessary to consider how such a substrate might be introduced to the core from above.”⁵

The scientists settle on the idea that heterogeneous solidification of other metals that have a lower energy barrier could have somehow been added to the core. These other metals would have originated from the lower mantle.

The main difficulty with this idea is another type of metal would have to drop from the lower mantle and sink to the centre of Earth before it is dissolved in the hot core. This is very difficult.⁵ The scientists suggest a large nugget of metal, one on the order of 10–100 m or more in diameter, could possibly sink all the way through the core to the centre of Earth before it is completely dissolved. But, even

then, such a metal substrate would still have a small but significant nucleation barrier. The problem grows if they consider how such a large body of solid metal formed in the mantle and how it broke off into the core:

“Potentially an even more serious obstacle to a metallic nugget’s delivery to the deep core is to survive dissolution at the top of the core while the nugget is descending through the mantle by Stokes flow ... If the base of the mantle is solid, it will be highly viscous, and a metallic body would have to be quite large in order to descend rapidly enough through the mantle’s base to avoid complete dissolution.”⁶

None of these mechanisms seems plausible.

Inner core nucleation paradox spills over into origin of Earth’s magnetic field

A further problem is that the growth of the inner core is considered to be the primary driver or energy source for Earth’s ‘geodynamo’ by causing convection in the liquid outer core. The existence of the magnetic field for millions and billions of years is a long-standing problem for naturalistic explanations.⁷ If the inner, solid core cannot form, the dynamo hypothesis becomes implausible.

Creation science implications

Rescuing hypotheses upon close examination do not rescue. Naturalism cannot explain why Earth has a solid core and a geomagnetic field. It can only observe that there is one. Since God created it that way, creation scientists do not have a paradox. Furthermore, the observed decrease in the magnetic field is exactly what a young earth creation would predict. Straightforward physics reveals that as an electric current circulates around the

liquid outer core, the current decreases with time due to electrical resistance. It is this circulating electric current that causes Earth’s magnetic field, which would also decrease with time. And, because the magnetic field could not have been too strong in the past without disastrous results, it indicates that Earth is young.⁷

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Glacial-like striations formed in less than 90 seconds

Michael J. Oard

Secular scientists postulate there were five major ice age periods (table 1). The Pleistocene is a geological period that generally brackets the recent ice ages within the past 2.6 Ma. This period does not reflect the post-Flood Ice Age, which generally corresponds to the uniformitarian ‘last’ ice age.

Pleistocene sediments or geomorphological features before the last ice age could represent either activity before an area was glaciated or Flood features. An example of the latter is found in the ‘terrace’ remnants along the northeast Wind River Mountains of Wyoming.¹ The remnants are commonly thought to be eroded outwash features from early ice ages. Yet, they are not connected to a moraine or any other glacial features. A better explanation is that they are pediments formed during channelized Flood runoff that were later dissected to remnants.

Secular scientists once believed there were only four ice ages, but now they propose 50 Pleistocene ice ages. However, the evidence on the land surface and in the ice cores from Greenland and West Antarctic reveal just one Ice Age. The other 49 are determined by wiggles in oxygen isotope ratios in deep-sea cores.² This determination came from their need for long ages and was justified by the weak Milankovitch mechanism, the astronomical theory of the ice ages.³ They explain the lack of evidence for previous ice ages on the continents by saying that the evidence for each previous ice age was destroyed by the succeeding one.

Regarding pre-Pleistocene or ‘ancient’ ice ages, secular scientists are adamant that there were four main ice age periods, each lasting for millions of years (table 1). Because of their strong commitment to ancient ice ages and because many of the diagnostic features are marine and from a tropical paleolatitude, they have been forced to conclude that the earth was totally or almost totally glaciated—more than once. They call this ‘snowball earth’. The fatal flaw with snowball earth is that it would be nearly impossible to melt the ice.⁵

Several secular authors have challenged some of the ancient ice ages, such as Shermerhorn, who warned that other geological processes can duplicate the major glacial diagnostic features, such as striated bedrock.⁶ Moreover, an ‘Eocene’ landslide, now at the top of the Gravelly Mountains of Southwest Montana,⁷ has resulted in striated stones in the landslide material and striated bedrock. Mass flows can produce these same ice-age-like features, including supposed diagnostic indicators.^{7,8} More recently, another report in the literature shows that landslides can produce not just glacial-like striations, but also several other features thought diagnostic of glaciation.⁹

A glacial-like striated pavement with other ‘glacial-diagnostic’ features

A rock avalanche on Jiweishan Mountain, China, occurred on 5 June 2009, killing more than 70 people. It

also destroyed farms and covered up an underground iron mine.

Some researchers who investigated the avalanche came to believe that the slide was a grain flow with low dynamic friction, and that the base of the slide was heated to about 800°C, producing high-pressure steam and carbon dioxide. They removed a thin covering of landslide debris on the mountain, providing a rare opportunity to examine the sliding surface. They were surprised to find “a well-preserved, polished and striated pavement ... highly reminiscent of a classical striated rock pavement from beneath a glacier”.¹⁰ Moreover, the striations and grooves were not always straight, but sometimes sets of striations crossed each other at an angle of up to 30°. This was previously thought to be diagnostic of glaciation, but this avalanche shows it can also be explained by shifting rocks in the bottom of the slide.

Moreover, the slide displayed chattermarks and plucking scars on the surface. Chattermarks are thought to be indicative of glacier sliding (figure 1). Because some of the striations had beginnings, they are reminiscent of nailhead striations thought to be produced only by glaciation.

Example offers more support that ‘ancient ice ages’ are Flood landslides

Several creation scientists have provided evidence that diamictite, a non-genetic term for a non-sorted or poorly sorted sedimentary rock with

Table 1. The five main ice age periods within the uniformitarian paradigm and their inferred evolutionary age range⁴

Geological period	Secular approximate age range
Pleistocene	11,700 ka to 2.6 Ma ago
Late Paleozoic	256 to 338 Ma ago
Late Ordovician	429 to 445 Ma ago
Late Precambrian	520 to 950 Ma ago
Mid Precambrian	2.2 to 2.4 Ga ago



Figure 1. Chattermarks from the Laurentide Ice Sheet on a polished, striated granite bedrock surface from Acadia National Park, Maine, USA

a wide range of particle sizes, and other glacial-diagnostic features can be a result of gigantic submarine debris flows during the Flood.^{11–14} The debris flows would be much larger than those of today because the Flood rapidly laid down huge volumes of sediments over large areas. An earthquake or some other perturbation (e.g. crater impact or tsunami) could easily start a huge slide that would flow rapidly and mostly come to a halt on a generally level surface, as with the Dwyka ‘tillite’ in South Africa.

If such a relatively small slide as the Jiweishan Mountain slide (a true post-Flood landslide) produced friction temperatures up to 800°C with high-pressure steam and carbon dioxide, the much larger slides of a global Flood would easily and quickly have slid long distances. Submarine landslides would produce all the so-called indicators of glaciation.

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South Caspian Basin supports a late Cenozoic Flood boundary

Timothy L. Clarey and Davis J. Werner

Repeated claims since the mid-1990s have been made by some creation scientists that the K-Pg (Cretaceous-Paleogene) boundary marks the end of the Flood and the end of marine deposition across the continents.^{1–4} Furthermore, they claim that the massive volumes of post-K-Pg sediments observed globally are the result of post-Flood local catastrophes.

In contrast, other creation scientists have contended that the K-Pg was not the end of the Flood and that Flood processes continued through much of the Cenozoic section.^{5–13} While acknowledging that the K-Pg boundary may have been the high water point of the Flood, they interpret much of the Cenozoic strata as the receding phase.

Massive Cenozoic marine deposits across North Africa, the Middle East, and Europe

The results of an examination of the sedimentary rocks across North Africa and the Middle East and across much of Central Europe dramatically conflicts with the prevailing K-Pg interpretation for the end of the Flood.^{12,13} These rocks show marine depositional processes continuing well into the Upper Cenozoic, supporting the premise that the Tertiary (Paleogene and Neogene) was the receding phase of the Flood and not post-Flood. In fact, many of these areas show uninterrupted deposition of carbonate rocks across the K-Pg boundary, from the Cretaceous through the Miocene.

Massive marine deposits across such vast areas of the world indicate that

Flood processes were still active well into the Upper Cenozoic, with strata extending across most of Syria and Iraq; these are areas just to the south of where the Ark landed and where the Tower of Babel was built.¹⁴ It is hard to imagine attempting to build a civilization while still under the waters of a Flood. What better proof could be found to make the case that the Flood

could not have ended at the K-Pg, but continued through the Miocene at least?

Southern Caspian Basin marine sediments extend through the Miocene

An examination of the rocks in the South Caspian Basin provides additional confirmation of a late Cenozoic Flood

boundary. This area also shows continuous marine strata from the Cretaceous level upwards through the Miocene, and even as high as the Lower Pliocene in the Middle Caspian Basin just to the north.¹⁵

Indeed, the Miocene marine rocks in the South Caspian Basin are the source rocks for much of the oil produced in the vicinity. These rocks have been studied by oil and gas companies and found to contain tremendous volumes of buried marine algae; some of these shales contain up to 12.39% TOC (total organic carbon).¹⁵

The primary source rocks in the South Caspian Basin are the Oligocene to Lower Miocene Maykop Series and the overlying Middle-Upper Miocene Diatomaceous Suite, which collectively are several kilometres thick.¹⁶⁻¹⁸ These strata were buried by upwards of 8 km (5 mi) of additional Cenozoic deposits, placing them in the oil generation window. Devlin *et al.* made special note of the maturity level of these sediments, stating:

“The ubiquitous nature of this source facies throughout much of the coastal and offshore regions of the South Caspian Basin is evidenced by prolific seepage of black oil.”¹⁹

Massive volume of Cenozoic sediments in South Caspian Basin

In total, the South Caspian Basin contains up to 17 km of Tertiary (Paleogene and Neogene) sedimentary rocks (figure 1), spread across a width of about 480 km (300 mi) and a surface area of about 181,000 km² (figure 2).¹⁶ To my knowledge, this is one of the thickest deposits of Tertiary sediment anywhere in the world.

If we assume all of the Tertiary rocks deposited here were post-Flood, then the bulk of these strata would have had to have been emplaced without any Flood influence and in a limited window of time prior to the onset of the Pleistocene Ice Age. Recall, the conditions for the Ice Age would

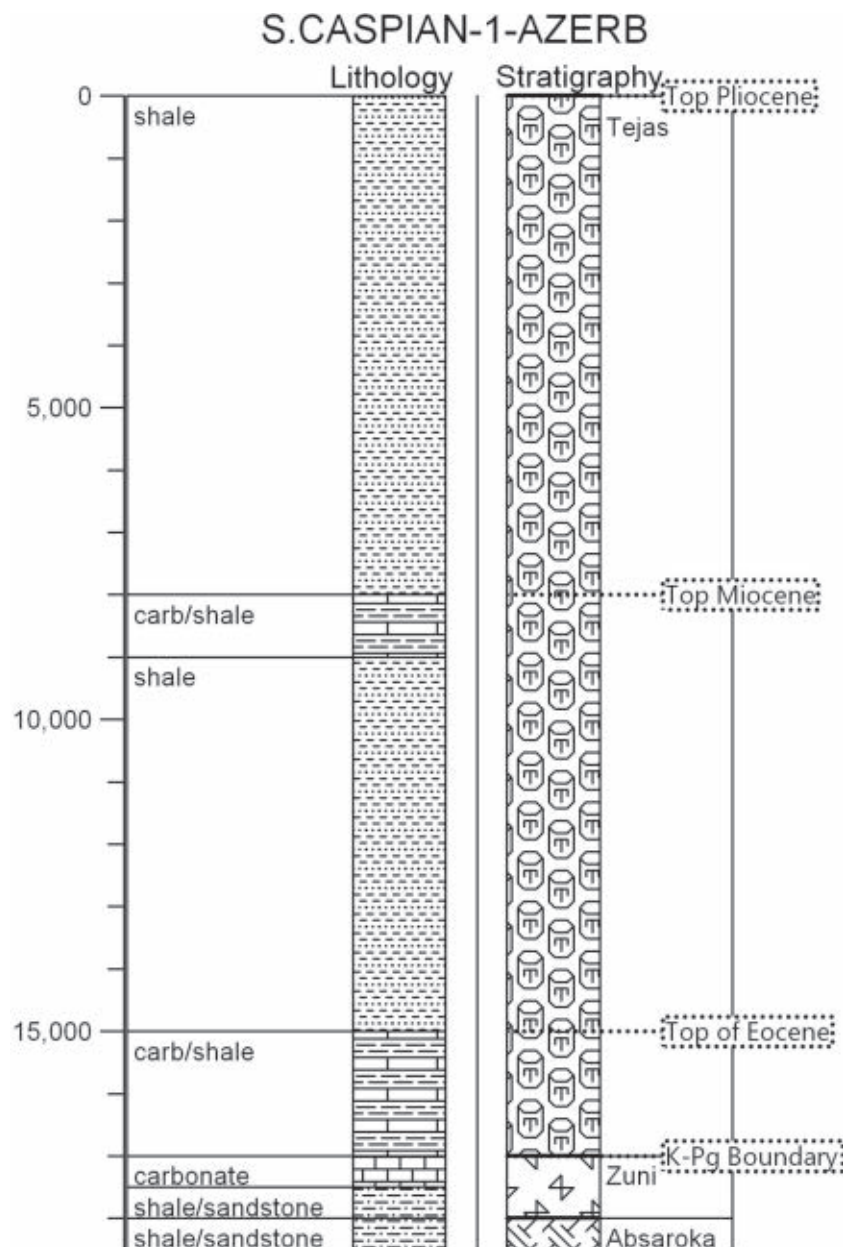


Figure 1. Compiled stratigraphic column (S.CASPIAN-1-AZEB) for the South Caspian Basin showing depth (m), megasequence (stratigraphy), and lithology. The K-Pg surface is near the Tejas-Zuni boundary. (Column location is shown on figure 2.)

have only been in place for a limited number of years after the Flood. The warm oceans from the creation of a new seafloor would have cooled and the prolific volcanic eruptions of ash-rich volcanoes would have begun to wane within a few centuries of the Flood cessation. As a consequence, the beginning of the Ice Age limits the window of time available for most of the Tertiary deposits to about 100 years, or at most 200 years.²⁰ If we assume a thickness of 15 km, then an average of 150 m of sediment per year must have been continually deposited across the South Caspian Basin in the timespan of 100 years. This equates to 12.5 m (41 ft) per month across an area of 181,000 km². This is no trivial volume in that short window of time. And even if we stretch the timeframe to 200 years, we still get an average of 6.25 m (20.5 ft) per month.

It is difficult to imagine local catastrophes creating this volume of sediment across such a vast area in such a limited amount of time. Also, how could anything survive in an area with this much active deposition?

Rocks indicate the post-Flood boundary was in the late Cenozoic

Once again, the claim that mostly continental rocks were deposited after the K-Pg boundary is shown to be utterly false. Uninterrupted marine deposition from the Cretaceous through the Upper Miocene is seen all across Central Europe, North Africa, Syria, and Iraq, and the South Caspian Basin. This prevents the picking of a post-Flood boundary any earlier than the end of the Miocene across this region. The receding phase of the Flood must have continued to deposit sediment throughout most of the Cenozoic across vast regions of Europe, Africa, and parts of Asia at least. Even many of the deposits in the upper Cenozoic across North America are better explained by the

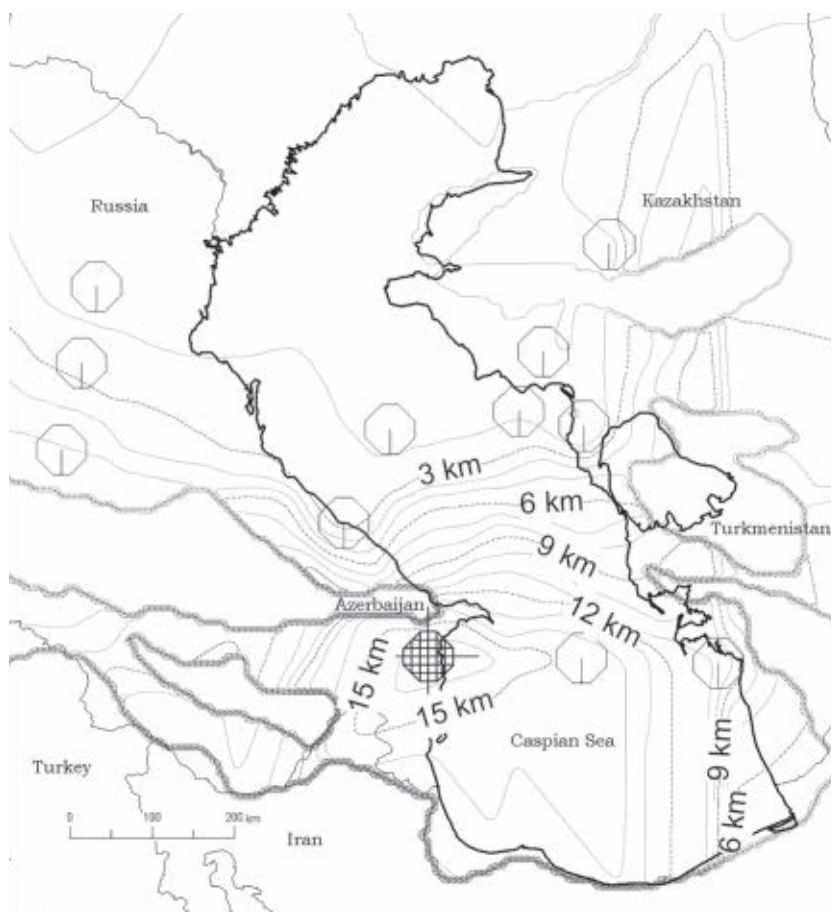


Figure 2. Thickness map of the Tejas megasequence (Tertiary) strata in the area of the South Caspian Basin, southwest Asia. The Caspian Sea is outlined in bold. Thickness contours are in kilometres. Column data is shown by circles. The S.CASPIAN-1-AZEB column is cross-hatched in the lower centre of the map.

receding phase of the Flood, like the vast Ogallala Formation spread across the Great Plains States of the USA.²¹

Interpretations must be measured by the strength of the data

Any scientific debate must be measured by the strength of the data supporting each viewpoint. Massive volumes of rock data that support an upper Cenozoic Flood boundary are far more compelling than merely basing conclusions on limited types of fossil data found in isolated locations. Fossil data depends on what is exposed and/or has been discovered. As such, it is always more biased as it likely does not give us a true representation

of the extent of the fossils themselves. Fossil data relies on what has been discovered, the preservation conditions, and the amount of volume exposed from erosion. Interpreting it is, by nature, very subjective.

Stratigraphic data is the most compelling type of data

Stratigraphic data is not as biased as fossil data and is much less subjective. It is a directly observable record of what has been deposited. Although some of the rock record has obviously been destroyed by erosion, what has been preserved is still telling. Indeed, the overwhelming strength of the global rock record needs to be

acknowledged in any interpretation of the Flood/post-Flood boundary.

The sheer volume and global extent of marine rocks deposited during the Tertiary is what tips the scale in favour of an upper Cenozoic post-Flood boundary. I suggest that this data set is so vast and complete that it is nearly inconceivable to argue otherwise.

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Fingernails and toenails—useless evolutionary relics or an important part of design?

Jerry Bergman

One common claim, which is also part of the ‘useless and poor design’ argument that Darwinists commonly use to discredit intelligent design and theism, is that fingernails and toenails are useless relics inherited from our ape past. As one article claiming the human body is poorly designed opined, “our toenails are useless other than as sites for infection or injury”.¹ The evolutionary explanation for both fingernails and toenails is that humans evolved from an ape-like primate that had four clawed paws used to climb and live in trees.

As life evolved further towards our more recent ape ancestor, the claws were lost, leaving the nails as a vestigial leftover. Then, as humans evolved, we retained the nails inherited from our more recent ape evolutionary ancestors. In short, fingernails and toenails were long considered by Darwinists as vestigial remnants of the claws existing on ‘lower’ animals today. Wiedersheim writes: “the nails of the fourth and fifth fingers (and especially the latter) most nearly suggest the claws of the lower animals”.²

Nail composition

The exposed parts of nails consist of several layers of dead, compacted cells and keratin which make them strong and rigid, yet somewhat flexible (figure 1). As will be discussed, the

nail's translucent portion allows an examination of various body health issues. Nails are called a "complex structure formed from the layer of the developing body known as the ectoderm" by the National Foundation of Ectodermal Dysplasias.³ Keratin is used in all horny body tissues, including nails, hair, feathers, the epidermis skin layer, and even the cornea of the eye.⁴ The genetics of nail development is very complex and not fully understood.⁵

Fingernail and toenail functions

Both fingernails and toenails serve numerous important functions. Fingernails primarily serve as a cover for the top surface of our fingers that gives them some degree of protection.⁶ Zaias lists one major function of fingernails: they greatly enhance the coordination of fine digital movements.⁷ Darwin wrote that in "one part of Africa ... the nails are coloured yellow or purple" as a means of decorating the body.⁸ Though many

women still paint their nails too, using them in decoration may have been far more important in less-advanced civilizations than in our modern world. Aside from their aesthetic function, they are useful and important tools for many everyday life tasks. Examples include scraping, grasping, cleaning, scratching our skin, and peeling fruit such as oranges. They can even function as tweezers to remove objects stuck to or embedded within the skin, including wood splinters.

The fingernail increases the sensitivity of the finger significantly by acting as a counter force when the front side of the finger touches an object. "Furthermore, it helps in certain cutting or scraping actions, and acts as an extended precision grip for the finger."⁶

Persons who, due to an accident, lose the tips of their fingers or toes, soon realize the full importance of the nail's functions. As one person stated: "I can't imagine what the world would be like if we didn't have fingernails to scratch an itch!"⁶ Furthermore, each nail unit is designed to function according to its place on the hand or foot.⁹ The most notable example is the opposable thumb, which is critical in holding things, such as pencils, spoons, and many other instruments, and the big toe, which is critical in balance and walking. These function are in contrast to the rest of the fingers and toes.

Ironically, the nail anatomy of humans most closely corresponds not to the chimpanzee, as evolutionists would expect, but rather the squirrel monkey.¹⁰ Furthermore, the nail root has a blood supply and is connected to the nerves, giving life to the nail-producing tissues and feeling to the nails themselves.

Fingernails and toenails help diagnose disease

Another important use concerns medical diagnosis.

"Both toenails and fingernails can also show signs of an impending ailment, genetic abnormality, and certain metabolic malfunctions and are therefore examined by many doctors to help in diagnosing certain diseases."⁶

The manual by Dr Zaias uses several pages to list all the diseases and health conditions in which nail examinations are useful, and in some cases of critical importance, to their detection.

Most nail problems are not a result of poor design, but rather are due to abnormalities caused by genetic factors, nutritional deficiencies, infection, and poor health.¹¹ For example, persons with an impaired immune system or general poor health may have nails

"... prone to infection. The nails and surrounding cuticle area may become infected by fungus, yeast or bacteria. If this occurs, nails may become thick or discolored, and the area may develop a bad odor, or become swollen and tender."¹²

This function is similar to the use of a canary in a mineshaft as a signal of a developing problem.

Doctors and paramedics often check the fingernails of an individual to ascertain if they are dehydrated or in shock. A delayed return to the characteristic pink colour of the nail after the applied pressure on it is released is a good indicator of hypovolemia, a rapid decrease in blood volume caused by shock or bleeding due to trauma. Both fingernails and toenails can be used for diagnostic purposes, but fingernails are usually more readily available for examination.¹¹

Nails used to detect poisons

Fingernails and toenails are excellent indicators of heavy metal poisoning, especially by arsenic, mercury, lead, or thallium. The nail is an indicator of both the amount of poison and

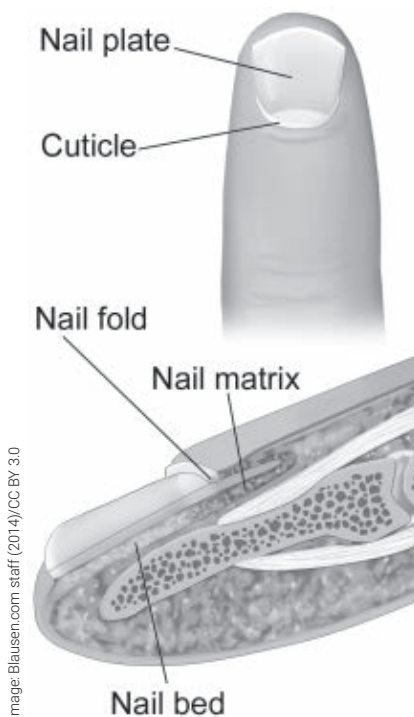


Figure 1. Nail anatomy

Image: Blausen.com staff (2014)/CC BY 3.0

the period since ingestion.¹³ Nail plots based on the “amounts of arsenic in the nail clippings show peaks which are attributable to arsenic entering the nail root via the blood stream”.¹⁴ Mercury poisoning produces distinctive black stripes indicating when the mercury was ingested.¹⁵

By using segmental analysis with neutron activation analysis, the physician can measure fairly accurately when the poison was administered and how much—information helpful to determining the guilty person in criminal poisonings.¹⁶ Often hair is used for the same purpose, employing the same techniques used for nail analysis. Hair has the advantage of giving a record of a longer time period available for evaluation, because hair is often allowed to grow for much longer than nails before being cut. Conversely, nails permit more rapid, convenient visual inspection that may indicate further analysis is warranted using hair.

In my experience, I remember one patient returned to the hospital several times with vomiting, nausea, and other symptoms and complaints. After several days in the hospital he felt much better and was released. When he returned with the same symptoms several days later, the young doctor on duty noted several distinct stripes on his fingernails. He immediately suspected his health problems were due to arsenic poisoning, which the laboratory tests soon confirmed. As suspected, his wife, who was suffering from dementia, was attempting to poison him. After this discovery, he took charge of the cooking, most of which involved relying on the senior centre for meals. He suffered no further episodes.

Toenails

Toenails have many of the same uses as fingernails. One major function specifically of toenails is to protect the toe’s distal phalanx. This function is very important for good balance and walking-running coordination.

Another important use for these “horny, lifeless growths” is that they “protect your sensitive toe-tops from constantly rubbing against your shoe-tops”.¹⁷

As is true for most other foot problems, most toenail problems are self-inflicted. “Feet were not really designed for socks and shoes.” They were especially not designed for a lot of the “high-fashion shoes that are so popular today, especially with young women”.¹⁷

Summary

The claim that the only reason humans have toenails and fingernails is because we inherited them from our ape ancestors, and natural selection has not selected them out of the gene pool, is incorrect. Both sets of nails serve numerous functions. One of these is the fact that for humans they serve as an important health window to our inner world, particularly for humans whose societies have developed a level of clinical expertise. Their importance is documented especially in those who have, for various reasons, lost their nails. When damaged by disease or accident, if possible, they are surgically reconstructed to achieve both normal finger and toe function as well as appearance.¹⁸ Even Darwin, in his chapter on rudimentary organs, noted that in humans imperfect nails sometimes grow on the stumps of amputated fingers, which are vestiges of the ones on our hands and feet.¹⁹

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Keen insights into Genesis 1–3 flawed by analogical days approach

Interpreting Eden:
A guide to faithfully reading and understanding Genesis 1–3

Vern S. Poythress
Crossway, Wheaton, IL, 2019

Keaton Halley

Vern Poythress is Distinguished Professor of New Testament and Biblical Interpretation at Westminster Theological Seminary and author of many books and articles on topics related to science and the Bible. His latest work, *Interpreting Eden*, offers guidance on how to properly interpret Genesis 1–3, and has a foreword by D.A. Carson. The book presents quite a juxtaposition of praiseworthy and problematic arguments. It contains a good number of thorough analyses and correct conclusions that biblical (young-earth) creationists should find very helpful. At the same time, a significant portion of *Interpreting Eden* is devoted to unsound reasoning against 24-hour creation days and in favour of the mistaken analogical days view. This review will highlight what Poythress gets right and respond to what I believe he gets wrong.

Continuity with previous work

First, an aside. For those who have followed Poythress's work carefully, there is not much new here. Many of the themes of this present work were formerly discussed in his 2006 book, *Redeeming Science*,¹ which was reviewed in this journal.² Although *Interpreting Eden* does develop and

elaborate on these topics, most of the chapters are slightly modified versions of nine articles that Poythress had previously published in the *Westminster Theological Journal* (p. 16). Regardless, it is convenient to have all this material in one place and organized into a coherent whole.

Areas of agreement

Except for a few qualifications and quibbles sprinkled here and there, creationists can largely agree with the material Poythress presents in parts 1 and 2, as well as his four appendices. Poythress supplies a summary at the end of part 1 (in chapter 7) of 15 hermeneutical principles for interpreting Genesis, all of which are either correct or only in need of slight modification. It is only in his last section, part 3, where more serious concerns arise, so these will be addressed below.

Here are some particulars Poythress gets right. He affirms inerrancy (chap. 3), and he takes several professing evangelicals to task for interpreting Genesis in a way that undermines biblical authority—including Peter Enns,³ Paul Seely and John Walton (chaps 4 and 9), and Kenton Sparks, including his misrepresentation of Calvin (Appendix C). He critiques their theologically liberal ideas that (1) God 'accommodated' by allowing scientific errors in the text (Appendix B), and that (2) the ancients—including the author(s) of Genesis—had faulty views of science which they incorporated into their writings, such as a belief that the sky consisted of a solid dome which held back a heavenly ocean (figure 1). Poythress's critiques are spot on, and



I recommend creationists familiarize themselves with his arguments, since the myths which he demolishes are extremely pervasive in the literature of theistic evolutionists and in academia generally.

Poythress also affirms that the Bible has primacy over science (chap. 4). He says that scientific evidence may prompt us to rethink our interpretation of Scripture, but only if this change can truly be derived from considerations of Scripture alone, apart from science. Scientific claims are not to be used as trump cards over Scripture, Poythress insists (pp. 58–60).

In addition, Poythress takes Genesis to be a true, historical account (p. 124), stating that the genre of its overall structure is prose narrative (p. 119). He regards Adam not just as an historical figure, but also as the first man, not having descended from apes, but who was uniquely created by God from dust (pp. 191–194).

Positions creationists should consider

In a few areas, Poythress delves into topics about which we biblical creationists differ among ourselves. Regarding most of these, my own opinion is that Poythress's arguments

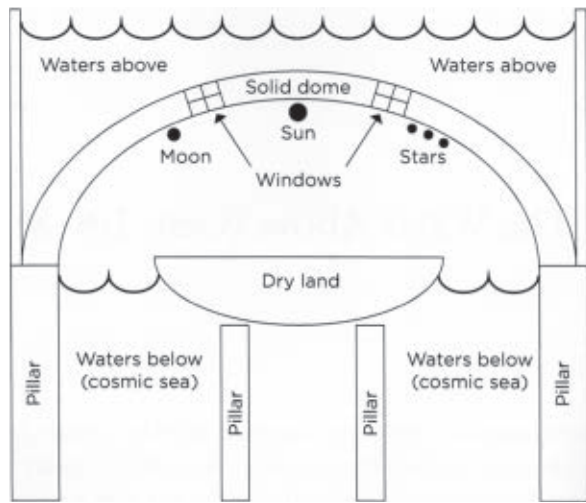


Figure 1. A typical graphical representation (from *Interpreting Eden*, p. 172) of the erroneous cosmology that many modern scholars allege is portrayed in Scripture. The Bible's authors are regularly accused of having depicted the sky as a solid dome, with a heavenly sea above and a flat earth below. Poythress effectively critiques this view as something read into, not out of, the Bible and other ancient texts.

are solid and his interpretations are correct. He is to be commended for laying out a clear case and interweaving numerous lines of evidence to support his conclusions. Three examples follow.

Genesis 1:1 as the first event

First, Poythress maintains that Genesis 1:1 is the initial event of creation, not a summary statement to describe all of Creation Week (p. 145). In Appendix A, he carefully and convincingly dismantles the arguments in favour of the summary view given by Bruce Waltke, and he offers positive reasons to affirm the initiation view instead.

Non-postulational language

Next, Poythress defends the position that Genesis describes natural phenomena from the perspective of ordinary observers, and is not 'theorizing' about more technical modern scientific concerns. Quoting from Bernard Ramm, he says that "the language of the Bible is non-postulational with reference to natural things" (p. 74). This means that, when Genesis 1 describes the moon as the "lesser" of the

"two great lights", for example, it makes no commitment to whether the moon generates its own light as opposed to reflecting it, and it makes no commitment to the moon's absolute size in comparison to other heavenly lights. All the description means is that, for ordinary observers, the moon is the second brightest light in the sky, after the sun.

Similarly, Poythress says that the Bible often portrays

the cosmos as a house or tent, but this is meant to be colourful imagery, not a physicalistic theory (pp. 87, 137–139). It would be a mistake, therefore, to see references to God's stretching out the heavens "like a tent" as allusions to the modern cosmological concept of the expansion of space. More likely, it is a poetic way of highlighting the fact that God created the sky overhead, which is visibly expansive in its extent from one horizon to another—much like a tent stretched overhead.

More examples could be presented, but these few should suffice to illustrate the principle, which can help to correct mistaken interpretations by both liberal and conservative exegetes. The Bible does not promote a faulty scientific cosmology, but neither does it contain much, if any, *advanced* scientific revelation—as opposed to making true statements about the observable natural order, including how and when God brought that order into being. One might argue about whether this principle has any exceptions, but I am convinced it is at least true in the main.

The waters above

Last, Poythress applies the aforementioned principle to Genesis 1:6–8

(Day 2 of Creation Week), and concludes that the mention there of water above the expanse refers to clouds, plus any other invisible water vapour in the sky that contributes to precipitation. He devotes chapter 9 to a defense of this position and a critique of the 'heavenly sea supported by a solid sky' view.

Here too, although some creationists may disagree with his conclusions, Poythress's excellent reasoning should be thoughtfully considered. Among his several points are the following. First, the language in Genesis 1 is phenomenal with some flexibility built into the term 'heaven'. Second, the Israelites and their ancient Near Eastern neighbours understood that rain and dew came from clouds. Third, the Bible often equates the heavens with clouds as the source of rain, using parallelism and other literary devices. Fourth, Genesis speaks of things that were relevant to ordinary Israelites—which is true of clouds but would not be true of a distant heavenly sea. I would add that the same criticism could be made of alternative creationist proposals, including the icy shell-aggregate models of Hartnett (at the edge of the solar system)⁴ and Humphreys (around the universe as a whole).⁵

Areas of disagreement

Given his careful reasoning throughout much of this book, it is unfortunate that Poythress promotes the analogical days approach to Genesis 1. His case falters in the following four areas.

The standard for measuring a day

Poythress tries to maintain that there is a difficulty in defining the length of the creation days, since whatever standard one might select to define it, he says, cannot be extended back to Creation Week. Why not? Readers should prepare for some convoluted reasoning.

First, Poythress says, it would be circular to define a day as 24 hours,

and then define an hour as 1/24 of a day. It would indeed. But terms are defined by common usage, and nobody takes the term ‘hour’ to mean 1/24 of just any arbitrary definition of the term ‘day’. Rather, we experience the passing of time; ‘hour’ and ‘day’ are designated as particular lengths we commonly experience. This is no tautology.

But Poythress anticipates the response that the language in Genesis implies that the days are the same length as the solar days we now experience. In reply, he claims that this response treats the sun’s apparent circuit through the sky as the standard for the length of a day. Yet he says this cannot be the case for the first three days of creation, since the sun was not there until the fourth day. Further, he insists, even the appeal to ‘length’ assumes a standard for measurement, and this standard “must already be in place *during* the first three days, not merely afterward” (p. 218).

This is clearly mistaken. Consider an analogy. If a modern story were to be written about Day 3 of Creation Week, and in it some of the trees God created were described as over 100 feet tall, will those familiar with American units comprehend the author’s meaning? Of course they will, even though the basis of the unit—a human foot—didn’t appear until Day 6, and the more precise standardization of that length and its division into 12 inches came later still. (If someone professed not to know whether these ‘feet’ mentioned on Day 3 were approximately 12 inches or instead miles long because of an absence of a standard for ‘feet’, we would accuse such a person of being obtuse.)

In the same way, the readers of Genesis may know the length of a day even when it is used to describe a time when the source of its length was absent. Strangely, Poythress himself comes near to acknowledging this when he points out that the Bible describes the amount of time Joshua had to defeat his enemies at Gibeon



Figure 2. How can a day’s worth of time pass without the motion of the sun on Days 1–3 of Creation Week? According to Poythress himself, this occurred in another instance, when the sun stood still for Joshua in the battle for Gibeon. But Poythress fails to appreciate that the approximately “whole day”, during which the sun “did not hurry to set” (Joshua 10:13), refers to a particular amount of ‘clock’ time, not an indefinite period of personal activity. Thus, Poythress’s appeal to Joshua’s circumstances as a justification for his claim that there is ambiguity in the length of the creation days ends up backfiring on him.

as “about a whole day” (Joshua 10:13). According to Poythress’s own interpretation, the sun was motionless (figure 2) in the sky during that time (p. 245), yet the term ‘day’ remains intelligible. Its meaning as a unit of time can be distinguished from, and should not be rigidly equated with, the source of that definition (whether the source is the apparent motion of the sun, the light/dark cycle, or the length of a typical human workday).⁶

Moreover, if it is comprehensible to refer to the elapse of a day’s time even when the light/dark cycle has been paused, how much more does it make sense when the light/dark cycle is present? This is what we have in Genesis 1. So, even if, for argument’s sake, we grant Poythress’s overly stringent criterion that the standard for defining a day must be present on each day, why could not the light/dark cycle serve as the standard? Poythress answers that without the sun, we cannot know how long those cycles took. After all, he points out, throughout Creation Week there were transitions in God’s activity from His initial, special work of creation to His ongoing work of providence. So it follows we cannot assume God operated by the same rules both while creation was taking place and afterward.

But if that’s where Poythress wishes to take the argument, employing the sun to serve as the standard will not tell us how long the creation days were either, as he later admits (p. 249). That is, if the cycle of day and night during Creation Week might not correspond in length to what we recognize as day and night today, for all we know the sun might have proceeded at a different rate as well. By this line of reasoning, we could not be certain what *any* of the words mean in Genesis 1, as we would have no standard by which we could compare those terms with things that go by their identical names today. Obviously, this presents a major problem. The words in Genesis 1, including ‘day’, must retain their meanings or else it would be impossible for us to understand God’s inspired communication to us about His creative acts.

‘Day’ as an indefinite cycle of personal activity

Poythress next advances his own view, that the days in Genesis 1 represent cycles of personal activity (such as work/rest for the first six days) or inactivity (such as God’s rest on the seventh day), rather than definite units of elapsed ‘clock’ time.⁷ He says, “The six days may be interpreted as God’s ‘workdays,’ the times of his personal

activity” (p. 266), and he insists that “Genesis 1 does not specify the length of each day, as measured by a modern technological timekeeper” (p. 250). Furthermore, he claims that even the period between ‘evening’ and ‘morning’—mentioned at the close of each creation day—refers only to a temporary hiatus from personal work as opposed to a particular length of time as might be measured by a clock (p. 267).

However, here Poythress ought to apply his own distinction between the *meaning* of a word and its *referent* (p. 301 ff.; similar to the ‘sense’ and ‘reference’ distinction proposed in 1892 by logician Gottlob Frege). The term ‘day’ commonly does *refer* to a period of work and rest, because God designed human beings to operate according to such rhythms—labouring in the daytime and sleeping at night. The 24-hour days in our common experience unavoidably include some combination of personal activity and inactivity. But the *meaning* of the term ‘day’ is defined by usage and context, and Poythress does not offer any exegesis to show that in Genesis 1 the term ‘day’ inherently carries the *meaning* of a rhythm of personal activity with no fixed length. Nor does Poythress show that ‘evening’ *means* an indeterminate period of time in which work ceases, or that ‘morning’ *means* an indeterminate time period in which work resumes.

In fact, Poythress has not demonstrated that the Hebrew terms for ‘day’, ‘evening’, or ‘morning’ are *ever* used to mean such things. Poythress is actually proposing new definitions for these words, but his whole case depends on an erroneous assertion that ‘day’ cannot mean a definite unit of time unless the standard for its measurement is present during the period to which the term is applied. As already shown above, this is not so. Rather, the context clues in Genesis demand that the creation days *mean* the time it regularly takes for one complete cycle of light (daytime) and

dark (nighttime). Thus, they *refer* to time periods of 24 hours.

Order of events

Another area where Poythress drops the ball is in his discussion of the order of events in Creation Week. On the positive side, unlike proponents of the Framework Hypothesis, Poythress does admit that the Genesis 1 sequence is presented “basically in chronological order” (p. 271). But he fudges with the word ‘basically’, and this tactic opens the door for him to arbitrarily rearrange things in an attempt to create a match between the Bible and deep time. He appeals to a paper by Bruce Waltke to suggest there may be some “shuffling of chronology”, although he is not dogmatic on this point and confesses that the evidence for it is ‘subtle’ (p. 270).

Unfortunately, though, Poythress goes on to offer a proposed harmony between the creation account and what he calls the ‘scientific’ (actually, evolutionary) account, in which he cherry picks points of agreement and glosses over the glaring contradictions (pp. 273–274). What are we to do with the fact that Genesis places fruit trees before fish, for example, when old-earth scientists tell us differently? No problem, Poythress says, quoting Derek Kidner, the trees simply “anticipate their chronological place in order to be classified with vegetation” (p. 271). But if Poythress is allowed to invoke topical rearrangements like this without the slightest exegetical grounds for adjusting any particular item, his position becomes unfalsifiable. An honest reading, however, in keeping with the way the New Testament authors interpreted Genesis, shows many blatant inconsistencies between Genesis and deep time.⁸

Problems brushed aside

Finally, there are a number of exegetical problems with Poythress’s old-earth, analogical days approach, which he either ignores or brushes aside too

quickly. For instance, Poythress does not interact with the New Testament material which takes human history to be co-extensive with natural history—a position fatal to all old-earth views.⁹ Also, the problem that all old-earth views face in placing human death, animal death, and carnivory prior to the Fall is only addressed in a single footnote (p. 159). There, Poythress simply asserts that the Bible does not preclude animal predation or death before the Fall, and he says that human death alone began after Adam sinned. He does cite a couple of verses and list a few references for more information, but creationists have already extensively refuted the weak sorts of arguments noted as his proofs. Not only is Poythress wrong about animal death, he fails to appreciate that his position on human death alone is inconsistent with his old-earth perspective.¹⁰

There are still other interpretive problems that Poythress does not discuss in this book, such as the incompatibility between deep time and the global catastrophe of Noah’s Flood. In a previous book, Poythress took the position that the Flood was a local event, and he explained away the Bible’s description of floodwater prevailing above the mountains by 15 cubits (Genesis 7:20) as snow piling up on mountain peaks.¹¹ This is clearly not what the author of Genesis intended, considering all the references in the account to rain, water rising and subsiding, mountain peaks appearing as the waters abated, and so on. Also, when the judgment was over, God promised Noah that He would never again send so great a Flood to destroy the earth, while He said not a word about safety from a second great blizzard.

Conclusion

Despite the serious missteps in this book regarding the creation days and the age of the world, *Interpreting Eden* does deserve attention. Poythress is a

useful ally to biblical creationists in many respects and he has a number of insights that creationists would do well to embrace. But Poythress himself would do better to abandon all the contrivances of his analogical days approach and instead come to embrace biblical creation.

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3. See footnote on p. 69.
4. Hartnett, J., The ‘waters above’, *J. Creation* 20(1):93–98, April 2006.
5. Humphreys, D.R., New time dilation helps creation cosmology, *J. Creation* 22(3):84–92, December 2008.
6. Poythress claims that the standard for the term ‘day’ in Joshua 10:13 is not a solar day, but the ‘experiential’ passage of time. He says it refers to “about a whole day’s worth of human activities” (p. 245). But what does he mean by “a whole day’s worth”? Clearly, this does not mean ‘as long as the human activity lasted’, or it would be tautologous. Rather, it must refer to a fixed unit of time, perhaps the length of time humans are commonly occupied with work during the daylight hours (8 hours?), or the amount of time the sun is ordinarily up (12 hours?), or the time during which humans are typically awake (16 hours?), or even the full 24-hour cycle. In any of these cases, though, Joshua’s ‘whole day’ means a definite amount of time which could be converted to other units, like hours, and it clearly refers to a time period that is around 24 hours or less. So this is of no help to Poythress’s claim that the creation days are ambiguous in terms of ‘clock’ length. The sun stood still for a particular amount of clock time, and the context of Genesis 1 likewise demands that the creation days are specific periods of approximately 24 hours, not open-ended periods of personal activity.
7. Poythress takes the seventh day to be everlasting (p. 265), but refers readers to his earlier book, *Redeeming Science* (ref. 1), for the argumentation. His reasoning there is spurious and has been answered elsewhere. See, for example, Is the seventh day an eternal day? *Creation* 21(3):44–45, June 1999.
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Orthodox on God; ambivalent on biblical literalism; bypassing science; socially conservative

Genesis: God, Creation, and destruction

Dennis Prager

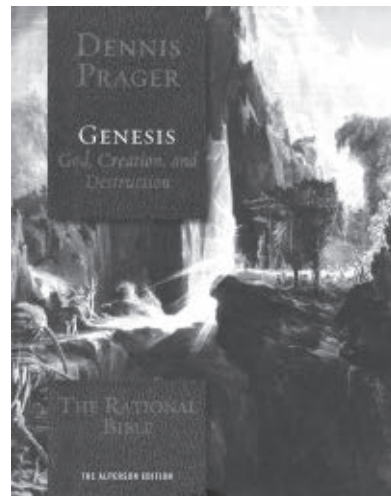
Regnery Publishing, Washington, D.C., 2019

John Woodmorappe

Author Dennis Prager is an American Jew, conservative talk show host, and author. Today he is probably best known as the founder of Prager University, which produces lots of short conservative videos featuring many different experts, and has been the victim of leftist censorship by YouTube. He has written a voluminous commentary on the Book of Genesis, which he has studied for decades. It is a sequel to his commentary on Exodus. I can only focus on a few issues here.

The nature of God

Most of Prager’s statements about God in Genesis 1 align with those of a Christian creationist. Thus, Dennis Prager affirms the fact of a Creator, God as a First Cause, a pre-existing (non-created) God, a creation out of nothing, a beginning to the physical universe, a Creator who is separate from nature, and a God of all people (and not just one tribe or nation). His assertion that God is separate from nature is in clear contrast with the pagan accounts, in which the gods are of nature or part of nature. The fact that God is not part of nature means that there is a reality beyond nature.



He also asserts that God is not a sexual being (all the pagan gods were sexual). Neither, he says, are the sun, moon, nor sea monsters deities, since they themselves were created by God.

The nature of human beings

The Genesis account teaches that there is a universal morality, and that ‘good’ and ‘evil’ are objective entities, not social constructs. Might is not right. Humans and animals have a soul (*nephesh*), but only humans are created in the image and likeness of God, and so have the capacity for holiness. Humans have unprecedented selfworth and have free will. There is an ultimate meaning to existence.

A minimal interaction with science

The author treats the claims of Genesis as an end in themselves, and

does little, beyond the superficial, to relate Genesis to science. However, he cites the work of Intelligent Design advocate Douglas Axe (p. 549). He also mentions the works of compromising evangelical Hugh Ross several times (pp. xxxi, pp. 16–18, 81, 550), but does not generally elaborate on them.

Prager repeats the clichés in which the Bible is not a book of science, where science is ever changing, where the Bible was written to be understandable, and where the Bible is basically a book of moral stories. His attitude can be summarized as follows:

“In other words, what is important here, as in all the stories of Genesis—from Creation to the Garden of Eden to the ages listed before the Flood and on to the patriarchs and Joseph—is what moral lessons are to be learned and what God wants from us. This does not answer the scientific challenge to people living hundreds of years. But, as pointed out in the Creation story, the Torah was not written to teach science. It was written to teach wisdom and how to live according to the will of a moral God” (p. 82).

How does Prager know this? All this raises a more basic question. Is the *only* information in Genesis 1 that of God being the Creator, and nothing more (figure 1)?

Now consider the Garden of Eden. Prager realizes that God surely could have created a serpent that could talk. However, he cites his teacher, Orthodox Rabbi Amnon Haramati, and the well-regarded Orthodox Rabbi Moshe Shamah, both of whom regarded the Garden of Eden as parabolic. In addition, Prager rejects the ‘Christian interpretation’ of the serpent being Satan. Here, again, he becomes selectively literal, citing the fact that the serpent is described as an animal—the ‘Christian interpretation’ does not insist that the serpent being Satan prevents the

serpent from also being an animal. In the end, the Garden of Eden becomes another moral story—one about the dangers of humans spurning God’s commandments and effectively becoming gods themselves by forming their own concepts of right and wrong.

Prager’s attitude to the Noachian Deluge is very similar. He comments:

“This is a good place to explain the importance of the Torah even if one doesn’t believe all the stories in it. Whether there was an enormous flood that destroyed much or nearly all humanity cannot be proven. I believe there was such a flood because I believe the Torah stories and because virtually every culture in the world has a flood story. But what matters more than whether there was a great flood are the lessons one derives from the story. That the Torah was alone in making the Flood story entirely a moral story is what matters. And it is, therefore, one of the many reasons I believe the Torah is divine in origin: mere mortals would not have made it up. No mortals anywhere else did” (p. 94).

Prager similarly confesses a disinterest about the nature of the fire that destroyed Sodom and Gomorrah

(p. 230). Again, what matters to him are the moral lessons taught.

No disrespect to creationists

Although Prager accepts ‘science’ as usually defined, he does not scorn creationists. He writes:

“I will explain why ‘day’ in the Hebrew Bible does not necessarily mean a twenty-four-hour period, but I do not disparage those who believe it means a twenty-four-hour period. Despite their rejection of science regarding creation, these people should not be dismissed as ‘anti-science’. I know some of these people, and they are highly respectful of science; some of them study science (and all of them go to doctors). People who truly reject science would forego modern medicine. I know no one who does” (p. 19).

Internal inconsistency on literalness

Christian compromising evangelicals have tried to ‘harmonize’ Scripture and science through such devices as the Day-Age Theory and the Gap Theory. Prager does not bother with any of this. He effectively waves a magic wand and pronounces that such-and-such is literal, and such-and-such is not. That suffices for him.

Prager frankly takes a pick-and-choose attitude towards Scripture. He wants the attributes of God, taught by Genesis 1 and elaborated on in the introductory part of this review, to be literal, but not the actual events of Genesis 1. On what basis? He follows this train of thought throughout his book. He wants the moral lessons of the Bible accounts to be literal, but not the accounts themselves. Again, on what basis? If the accounts are not factual, then what is there to prevent the moral teachings from being non-factual?



Figure 1. Is God the Creator the *only* information that can legitimately be derived from Genesis 1?

In an effort to find a ‘reconciliation’ with science, Prager is open to the days in Genesis 1 being non-literal, and he falls back on Psalm 90:4. But, even in the Jewish Bible he uses, it states: “A thousand years in your sight are *like* a day that has just gone by, or *like* a watch in the night [emphasis added].” Clearly, this is in reference to how God experiences time. It states that the thousand years is *like* a day to God; it does not state that the thousand years *is* a day to God.

Prager understands the evening that starts each day in Genesis, and in everyday Hebrew usage, literally, but not in the seven days of Genesis 1. In other words, the evening that starts each day in the calendar is obviously literal, but the evening that starts each day in Genesis 1 is not. Again, he picks and chooses. This has additional practical implications. The weekly observed Sabbath day, very much a part of Orthodox Jewish life, is obviously a literal 24-hour day. But the seventh day of Genesis, when God rested, and which the Sabbath day commemorates, is not. How strange. Prager’s reasoning is consistently inconsistent.

Interestingly, Prager notes that Genesis 1 puts human beings as the last of the creation (p. 7). This detail he finds significant, as it agrees with the ‘scientific’ (read ‘evolutionary’) worldview, and so he takes it literally. But he is inconsistent in that, while taking the *order* of creation events in Genesis literally, at least this one time, he does not take the events themselves literally. On what basis? In saying that the late appearance of humanity is factual, he is now saying that ‘the Bible is a book of science’, while elsewhere he affirms that ‘the Bible is not a book of science’. He cannot have it both ways!

Finally, Dennis Prager does not answer how one can build a compelling moral story, let alone a divine moral story, about something that did not

happen. And if mere mortals can make up a story of a global flood, why can they not also make up the moral significance of that flood? How do the moral teachings of the Flood become factual at the same time that the Flood itself is not factual?

The Bible can teach science

Prager briefly departs from his ‘Bible is not a book of science’ meme as he describes Rachel’s delay in conceiving (pp. 357–360). Reuben had brought mandrake plants, and Rachel asked for them (Genesis 30:14). Now, the mandrake, according to popular superstition, has the power to induce pregnancy, and Rachel evidently believes it. Rachel finally gets pregnant and gives birth to Joseph. However, Prager reminds us of God’s statement that He, and not the mandrakes, had enabled Rachel to get pregnant (Genesis 30:25).

The JEPD hypothesis

The author does not specify if he believes that Moses wrote the Pentateuch. He notes that use of different names for God does not necessarily imply different documents; *Adonai* emphasizes the mercy of God while *Elohim* emphasizes the justice of God (p. 32). Nevertheless, he is open to the possibility that the apparent contradictions in the Book of Genesis were caused by separately written traditions that had been fused together, by a redactor, centuries after they had first been written (p. 102). However, he realizes that apparent contradictions in the text can be reconciled while affirming a single source (p. 428). In fact, he cites Robert Alter, a secular scholar, who considers the JEPD ‘obtuse’ in attributing to duplication the apparent contradictions that actually exist in order to highlight the dramatic and psychological situation in the text (p. 564).

Why God is portrayed as male

Since God is personal, portraying God as neutral or genderless is not possible, according to Prager. The choice of male is deliberate. The male is more rule-oriented than the female. Prager notes that children who grow up without a father are many times more likely to be in poverty and to be involved in crime (p. 10). A study of female inmates (p. 11) shows that more than half come from a fatherless home.

How does this relate to God? Prager explains:

“In other words, if one’s primary goal is a good world—specifically a world with far less murder, child abuse, theft, rape, and torture—a God depicted in masculine terms (a father in Heaven), not a goddess (a mother in Heaven), must be the source of moral and ethical commandments such as ‘Do not murder’ and ‘Do not steal’” (p. 11).

Prager concludes: “We have too many absent fathers on Earth to even entertain the thought of having no Father in Heaven” (p. 12).

Of course, God also has a feminine side. However, the use of *El Shaddai* (Genesis 17:1), as sometimes claimed, is not an allusion to it. Rather than being related to *shaddayim* (breasts), the word *Shaddai* alludes to *sheh-dai*, meaning “it is enough/sufficient”, so God (El) is the Sufficient One (p. 193). Several other interpretations are possible (p. 556).

The specifically Jewish view of God

The very name ‘Israel’ means ‘struggle with God’ (Genesis 32:29). Prager adds: “I am often surprised by how many Christians—many of whom know the Old Testament better than many religious Jews—do not know that ‘Israel’ means ‘struggle with God’” (p. 390). The ‘struggling with God’ contrasts with Islam, which means ‘submit to God’.

Prager is even-handed. He enjoins the atheist to struggle with his unbelief as much as the believer struggles with his belief. Interestingly, and not surprisingly, he suspects that Jews and Christians struggle with faith more than atheists struggle with their unbelief (p. 389).

The ‘struggling with God’ occurs when one goes through tragedies. It can also involve everyday situations. For instance, Prager comments:

“The view of God as provider can lead to problems—to regarding God as a sort of ‘celestial butler’, a heavenly being whose purpose is to provide for us whenever we need something. This is not only unsophisticated; it can be dangerous to one’s faith. If God’s primary role is to do things for us, what happens when He doesn’t? People may stop believing in Him. If the Provider stops providing, maybe there is no Provider” (p. 411).

In the end, Prager is rather vague on the whole subject of ‘struggling with God’. He does not answer this question: when does ‘struggling with God’ cross the line into just plain grumbling?

The traditional Jewish belief in life after death

Judaism does not stress the afterlife as much as does Christianity, but this does not mean that belief in an afterlife is absent. With reference to Genesis 25:8, Prager comments:

“The idiomatic expression, ‘gathered to his kin’, is also used to describe the deaths of Isaac, Ishmael, Jacob, Aaron, and Moses. The phrase strongly suggests the person has joined his/her kin in the afterlife. No other meaning of the phrase makes sense. It cannot mean the dead person was buried with his kin—for two reasons. First, the expression ‘gathered to his kin’ is used even when the person was not buried with his kin ... Nor can the expression simply mean the person

died because, as in this verse, the text has already stated the individual has died ... Belief in the afterlife was not, as many scholars contend, a later adoption from Greek or Zoroastrian philosophy” (p. 291).

Man is not basically good

Dennis Prager parts ways with the liberal views of the vast majority of Jews. He rejects the notion that humans are basically good. He sees people as born innocent, but prone to do bad things. He sees the sin of Adam and Eve, not in the Christian way of causing original sin, but rather as people sinning in imitation of the actions of Adam and Eve (p. 61). Prager realizes the fact that the popular ‘man is basically good’ notion is a product of the Enlightenment.

Children must be told many times, and not just once, to express gratitude to others. Children frequently bully other children. And now for the adults: in history, we have had the Roman Colosseum, the almost-universal institution of slavery, and incessant wars. In the 20th century, we had Nazism, Communism, and the Armenian, Herero, and Hutu genocide.

Commandments are necessary to keep humans in line. The conscience which humans possess, in the absence of explicit commandments, does not make man good. The conscience can easily be manipulated into thinking that it is doing good while doing evil, and the conscience can be dulled through the performance of evil. Finally, the conscience is usually not nearly as powerful as the natural drives of such things as greed, envy, sex, and alcoholism.

Belief in Hell, but not Heaven, improves behaviour

Prager, first of all, demolishes the ‘progressive’ myth that criminals got that way because of low self-esteem.

Just the opposite. Violent criminals have a very strong sense of personal superiority. In fact, few people have higher self-esteem than do violent criminals.

Author Prager cites a large study by Professor Azim Shariff (p. 513). Based on 26 years of data, and consisting of 143,197 people from 67 nations, Shariff found that a nation’s rate of belief in Hell predicts lower crime rates. This is even so when other factors are taken into account.

The foregoing extends to non-criminal behaviour. Another study by Shariff found that students were more likely to cheat when they believed in a forgiving God than in a punishing God (p. 513). Shariff is quoted as saying: “It’s possible that people who don’t believe in the possibility of punishment in the afterlife feel like they can get away with unethical behaviour. There is less of divine deterrent” (p. 513).

Affirming capital punishment for capital crimes

Dennis Prager is one of the relatively few American Jews who support the death penalty. He soundly rejects the notion that there is nothing a person can do to deserve to be put to death. He points to the fact that the vast majority of people whose loved ones had been murdered say their suffering is immeasurably increased by the fact that the murderer is alive and being cared for. He quotes the relatives of a high-profile murder victim: “My family got the death penalty, and you want to give murderers life. That is not justice” (p. 124).

In the Torah, the death penalty is prescribed for various offences, not in order that the sentence be carried out, but to show the seriousness of the sin. In the case of the murderer, however, the Torah treats the death penalty as a fundamental building block of society. It is repeated in all five books of the Pentateuch!

Does the death penalty have a deterrent effect? At least in some cases it does (Deuteronomy 19:20).

The modern view is that sparing the life of the murderer reflects a more morally advanced society than in ages past. Not so. Any lesser penalty means that the taking of a human life is not considered the horrible offence that it is. In fact, this was recognized, long ago, in the Torah. Many ancient cultures allowed blood money to be paid in lieu of the death penalty for the murder, but the Torah forbade it (Numbers 35:31). Nor could a fugitive murderer be given asylum in a city (Deuteronomy 19:11–13), or in the temple (Exodus 21:14).

Prager addresses some Talmudic teachings that discourage the application of the death penalty. He points out that they were written while the Jews were under pagan Rome, during which time large numbers of innocent people were put to death, often with the use of torture.

Conclusion

Prager has written a detailed commentary, on Genesis, that is a curious mixture of theological liberalism and social conservatism. He is internally inconsistent in his understanding of the Bible: he effortlessly (and rather arbitrarily) shifts between accepting and not accepting some aspects of the Bible literally.

The author shows valuable insights that challenge some of the popular socially liberal views that hold sway in Western societies. This especially has to do with human nature.

Healing division or courting heresy?

The Fool and the Heretic: How two scientists moved beyond labels to a Christian dialogue about creation and evolution

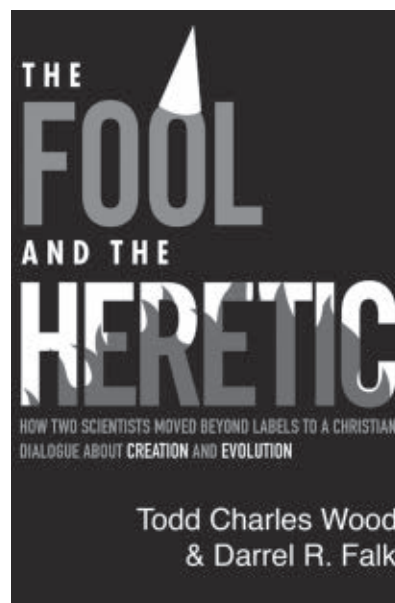
Todd Charles Wood and Darrel R. Falk

Zondervan, MI, 2019

Gavin Cox

Long on rhetoric and short on science, *The Fool and the Heretic* (F&H) brings together two scientists with (allegedly) diametrically opposite views regarding the evolution-versus-creation controversy. This Christian exchange was intended to progress beyond the invective that can mar such debates. It was organised by Rob Barrett of the Colossian Forum in the interest of Christian ‘unity’, a forum that has its science and education wing funded by The Templeton Foundation,¹ which is committed to teaching theistic evolution.² The Colossian Forum is, therefore, far from impartial in its mediation between the opposing sides. Barrett also wrote the foreword and commentary on the chapters.

As may be inferred from the title, Todd Wood, described in the book as a young-earth creationist (YEC),³ poses as the science-denying ‘fool’ while Darrel Falk, a theistic evolutionist (TE), poses as the Bible-denying ‘heretic’—monikers derived from either side of the debate. Falk is a co-founder of *BioLogos*, a proselytizing ‘Christian advocacy group’ whose sole purpose is to sell evolution to evangelicals—no matter at what cost to biblical inerrancy.⁴ Wood is founder and president of *Core Academy of Science*, an educational and research



organisation teaching science from a YEC perspective. Both men have Ph.D.s in evolutionary biology, with post-doctoral training, so are well matched in their scholarly standing.

What makes F&H a frustrating read is that the authors talk past one another, and Falk is not held accountable for his brazen apologetic for evolution and scientism. Wood, unfortunately true to form, also makes astonishing and unfounded claims in support of evolution, which are challenged in this review. Each chapter ends with questions for group study. However, these are leading questions, subtly designed to encourage scepticism for creationism. The overall format and tone of the book (Falk and Barrett have the last say), ‘stacks the cards’ against the YEC position.

Meeting the enemy

Wood describes his apprehension at the prospect of meeting Falk (to discuss their differences, and why they

believe what they believe) because it was seen almost as a grand experiment, to see what would happen (p. 24). He admits the fearful prospect of meeting a co-founder of *BioLogos*: “If there’s anyone in Christianity who’s my archenemy, it would have to be Darrel. So I have to love him, and I felt I should at least meet this enemy I was supposed to love” (p. 85). Wood relates the first meeting with Falk and, true to type, Falk accused him of not ‘knowing science’, rigidly defined as naturalism. But after Wood reeled off his evolutionary scientific qualifications, Falk had to apologize, recognizing he had hurt Wood’s feelings (p. 89). Falk admits that many in his community have belittled YECs (p. 92), so he was initially doubtful if Wood would really want to meet him.

Todd Wood: there’s vast evidence for evolution!

Wood’s opening salvo in chapter one is greatly concerning, setting his entire case on the back foot. He claims:

“Darrel R Falk is ... right when he says that evolutionary scientists have collected a vast amount of evidence supporting the theory of evolution ... that there’s evidence supporting the evolution of humans from animals over millions of years ... that evolution is an extremely successful theory, accepted almost without question by a huge majority of the world’s scientists” (p. 29).

Wood claims *Australopithecus afarensis* (figure 1) “had knees and hips for walking upright on two legs, like modern people” (p. 155) and considers the small, hyrax-like *Hyracotherium* was the horse ancestor, as per evolutionary theory. Not surprisingly, Falk gleefully states: “Todd is the first to admit that there isn’t enough scientific evidence to support young-earth creationism” (p. 98).

From someone from within the YEC fold, these are worrying words. But statements like these are consistent with Wood’s blog, where he writes

there are “gobs and gobs” of evidence for evolution.⁵ However, when it comes to this evidence, Wood is deeply misinformed. The fossils demonstrate *A. afarensis* was a knuckle-walker and the hips, pelvis, ankle, knee, and inner ear were all orientated for quadrupedal locomotion.⁶ A leading expert on horse evolution, Jens Lorenz Franzen, is far less certain than Wood, stating: “The first chapter in the evolution of the horse—during which all of these developments took place—is missing.”⁷ Wood should have made clear that evidence is interpreted through a commonly held worldview, or paradigm.



Image by: Ephraim33/CC BY 2.5

Figure 1. Skeletal features of *Australopithecus afarensis*, specifically the distal radius, demonstrated knuckle-walking morphology, typical of living apes, chimpanzees, and gorillas.

In academia, methodological naturalism, *a priori*, rules God out at the philosophical level, requiring that naturalistic explanations are the only ones allowable. Thus, to question the paradigm is to commit intellectual and career suicide. But consensus science never makes for good science.⁸ Having been trained in evolutionary biology, it appears that Wood cannot separate himself from that paradigm. He sees evidence for evolution everywhere because that’s the way he has been educated to interpret the evidence. However, he does offer an informed discussion of the inconsistencies of holding evolutionary belief as a Christian—while still holding some of those inconsistencies himself.

Falk: creationists harm the church!

When it comes to YEC beliefs, Falk thinks Wood is “harming the church” by “contributing to the declining influence of the Christian faith on culture” (p. 45). But according to this logic, Jesus also harmed the church, by teaching that God made humans male and female at the beginning of Creation (Mark 10:6) and that Noah’s Flood was an historic, global event (Matthew 24:37–39; Luke 17:26–28). Furthermore, the ‘resurrection from the dead’ or ‘Christ’s miracles’ can be interchanged with ‘YEC’; for in Falk’s argument, these too were historical, supernatural events, non-repeatable, non-observable, thus not subject to scientific scrutiny.

Following Falk’s reasoning, since consensus science cannot accept bodily resurrection and miracles any more than it can accept six-day creation, the latter should also be excised from Christian belief in order to appease scientists. Falk recognizes the dilemma—one raised by liberals over a century ago—but offers no viable solution, blindly denying that evangelicalism could go the same way (p. 147). Furthermore, Falk reasons that if people learning science

“embrace the YEC perspective, then they will not have a place at the table” (p. 49). Of course! Because “the table” only admits those who submit to naturalism!

Contrasting testimonies

Reading the testimonies of Wood and Falk, it becomes apparent that, as children, they had different foundations to their faith. Wood had a solid biblical foundation, including creation, but Falk did not, and the results are very telling. Wood mentions a couple of minor intellectual crises which he went through at university, whereas Falk admits he fell away altogether because of doubts he had regarding the Bible. For Wood, it was after reading John Horner’s *Digging Dinosaurs*, which describes nests buried in multiple layers in the same location,⁹ that doubts were raised as to how more than one layer containing nests in the Flood was possible. However, Michael Oard has published answers to exactly this question, which Wood does not mention.¹⁰

Doubting God, believing evolution

Chapter four makes sad reading as Falk narrates his faith struggles over questions of evolution. He claims saving faith aged four (p. 65), but by the age of eleven he professed doubts that Scripture accurately described physical reality, based on his childish interpretation of the “four corners of the earth” (Revelation 7:1, 20:8). In seventh grade, he encountered teaching about evolution and human fossils and their interpretation by “really intelligent” scientists. He asked: “Could they all be wrong and the Bible right?” The answer is yes, and the latest fossil evidence more than answers Falk’s objections.¹¹ One feels pity for Falk, as he describes how such questions caused doubts to arise in his young mind. He prayed for a

confirming sign of God’s reality, which he says wasn’t forthcoming (p. 67).

Later, Falk attended the University of Alberta, where he obtained a genetics degree but, while there, abandoned his faith (pp. 71–72). During his post-doctoral fellowship, he had a change of heart for the sake of his children, so that they would not abandon Christianity and experience the emptiness he was feeling. Falk relates how he returned to God but he expresses no doubt that God used evolution to create (p. 70). This caused him to feel there was no place for him or his family in evangelical churches. This is tragic, firstly because Falk admits he doubted God’s existence rather than doubting evolution. Secondly, his commitment to evolution dictated which kind of church his family attended—a liberal church which had “no problem” with his views on evolution.

After post-doctoral work, Falk joined the faculty of Syracuse University. He longed to be part of a “dynamic church” emphasizing a “personal relationship with Christ”, but without feeling like a “second-class citizen” because of his acceptance of “mainstream science” (p. 75). Falk eventually found a church that accommodated his views, so was happy to take his family there. Here he taught young adults in Sunday school—though one wonders what compromises of Scripture with man’s thinking they may have been exposed to?

Genesis is history

Chapter seven, by Wood, makes for comparatively encouraging reading. He correctly states that if Genesis 1–11 is treated as non-historical it affects everything else. For example, the Ten Commandments are founded upon the historical truth of God creating all things in six days. Wood perceptively asks, what are the criteria for accepting any miracle of Christ if we don’t first accept the miracle of creation? Wood asked Falk this very question, but he

“never received a satisfactory answer”, other than that Falk claims to accept the Bible’s historicity, unless there are “really good reasons” to interpret Scripture another way! Wood asks, but what’s a “really good reason?”, as Falk had not explained his thinking (p. 111). It is very clear that Falk places his own reasoning powers above Scripture when it contradicts evolutionary history.

Evolution’s overwhelming evidence?

Falk parades ‘evolution as fact’ in chapter nine and this remains unchallenged in F&H, so his claims will be briefly examined here. The search for fossil intermediates between fish and amphibians, Falk explains, was predicted to yield results at c. 370 million years ago. Lo and behold, after five years of searching, a team discovered a fossil allegedly having both fish and tetrapod characteristics, which Falk states was “consistent with the hypothesis” (p. 130). Presumably he is referring to *Tiktaalik roseae*, the much older ancestors of which (according to dating methods Falk upholds) were themselves tetrapods, ‘dated’ 18 million years older. *Tiktaalik*, therefore, should be relegated to an evolutionary side-branch, thus divesting it of its ‘missing link’ status.¹² But this was understood nearly a decade ago. Maybe *Tiktaalik* is an icon he just can’t let go?

Falk discusses the correlation between radiometrically dated rocks and the fossil order expected by evolution. From single-celled creatures through to multi-cellular organisms in rocks of decreasing age, Falk states, “this is exactly what is found” (p. 135). But this is exactly what is not found in many instances! Out-of-order fossils are common,¹³ and the proverbial ‘Cambrian rabbit’ exists, specifically in the form of pollen in pre-Cambrian rock—pollen (necessarily produced by multi-cellular plants) believed to have evolved one billion years later within

the evolutionary time-scale.¹⁴ And this despite Falk's clear pronouncement that rocks "greater than one billion years old have never revealed a fossil of a multicellular plant ..." (p. 136).

The so-called Cambrian Explosion was the glaring exemplar of the rule of lack of transitional creatures in Darwin's time, becoming increasingly obvious in the subsequent 150 years of worldwide paleontological research, demonstrating that the lack of transitional forms from non-life to every basic body plan of all major phyla is real.¹⁵

Falk also disagrees with Wood's reading of Genesis on the basis that "it contains poetic elements" (p. 133). Falk needs to be called out here on his sloppy biblical hermeneutics. Hebrew scholars identify the genre of the creation and Flood passages in Genesis as historical narrative, not poetry, by the presence of Hebrew narrative tense markers—*waw*-consecutives.¹⁶

Fellowship at any cost

Within eight pious 'interludes', between opposing chapters, moderator Rob Barrett clearly demands fellowship at the expense of truth (correct doctrine). He calls for Christians to offer their lives for each other, even as Christ did, quoting John 15:13 (p. 17). But when it comes to the age of the earth, that verse is not a command for Christians to lay down truth! Scripture says we are to "earnestly contend for the faith" (Jude 1:3), to lay down our lives, yes, but not truth. Jesus never once laid down truth! Barrett misuses Matthew 22:40:

"All the Law and the Prophets hang on these two commandments", asking, "if everything hangs on these two things, maybe the battle over evolution does too ... could asking for forgiveness when we've offended a brother be mysteriously linked to resolving the controversy over evolution?" (p. 103).

Barrett is both subtle and manipulative. Yes, we are commanded in

Scripture to love and forgive, but that same Scripture makes definite claims about creation which can only resolve the origins controversy if its claims are accepted. Furthermore, what is the biblical definition of love if it fails to rebuke, warn, and reprove (1 Timothy 5:20, 2 Timothy 4:2, Titus 1:13)? And what of those who profess Christ, but will not repent of their error? Paul was clear in his letter to Titus, that a divisive person should be warned "once, and then ... a second time. After that, have nothing to do with them" (Titus 3:9–11, cf. 2 John 1:10–11). These clear biblical guidelines on dealing with false teaching and divisiveness within the church need to be followed.

Reading F&H one gains the impression the Colossian Forum was driven by another agenda—one aligned with the dangerous false teaching promoted by *BioLogos*. Barrett's ploy, therefore, is an insidious bullying tactic to get YECs to compromise truth for the sake of 'unity'.

Here's the rub: if fellowship is not based on truth, it is not genuine fellowship; it is capitulation. The Apostle John (2:1) said we shouldn't eat, have fellowship with, or even greet those who claim to profess Christ, but do "not abide in the teaching of Christ". So according to this rule, is the endeavour of this book and continuing fellowship¹⁷ with Falk and *BioLogos* a contravention of this Scriptural mandate? I am not saying that because Falk and *BioLogos* believe in evolution that this somehow disqualifies them from being born-again. The issue here is can fellowship be maintained with Christians who, after being corrected, continue to promote false teaching?

Jesus' clear teachings on Creation and the Flood consistently upheld Genesis as divinely inspired, authoritative history. Neither Jesus, nor any of the New Testament writers, taught anything that could be construed as support for biological evolution, or a billions-of-years age for the earth. Those who believe evolution is true knowingly or unknowingly make

Christ and His Heavenly Father out to be in error when it comes to Earth history—which is blasphemous.¹⁸ How can there be unity with those who knowingly hold such positions?

Conclusion

A particular study question stood out, which asks:

"Most young-earth creationists are critical of Todd for acknowledging that evolutionists have collected a large volume of credible evidence. What do you think? Is he hurting the cause by giving evolutionists so much credit? Or is he giving creationists greater credibility?" (p. 37).

This is quite the question to ask, because Wood has made some baffling statements in support of evolution, both in this book and elsewhere. There is a danger that unchallenged dialogue of this sort might actually bring biblical creationism into disrepute in the eyes of unwary or less-informed readers.

F&H only muddies the water. There is no adequate accountability in the exchange recorded in the book, in terms of holding Falk to account for his brazen evolution proselytizing. None of Falk's 'tired old' arguments are rebutted, and, unfortunately, Wood just adds more fuel to the fire. His concessions to the other side were not matched. Clearly they didn't help move Falk away from his compromised view, but might well have enabled Falk to think he was moving Wood towards an evolutionary view.

Barrett's interludes promoting unity at all costs leave the casual reader with the impression that YEC is the problem—a lost cause. F&H, therefore, makes for uncomfortable reading for biblical creationists. What may be more concerning is that Wood's continued dialogue with *BioLogos* and the Colossian Forum (p. 193) appears to be going where angels fear to tread. Brave or naive? Only time will tell, but some readers may consider the

warning of Matthew 7:6 is relevant here.

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Debunks many science-related historical myths that demean the Christian faith

Unbelievable: 7 myths about the history and future of science and religion

Michael Newton Keas

ISI Books, Wilmington, DE, 2019

John Woodmorappe

The author is a senior fellow at the Discovery Institute and a former Fulbright scholar. He is a philosopher-historian of science. His work touches on common distortions of history, notably those involving the so-called Dark Ages, Columbus, and the flat earth, and the trials of Giordano Bruno, and Galileo. He also examines the implications of the artificial intelligence (AI), and potential existence of extraterrestrial life.

The myth of the Dark Ages

The legend of the anti-learning Middle Ages is pretty durable, as it has served several purposes. It was originally part of the polemicism of the Protestants against the Catholic Church. It enabled the thinkers of recent centuries to look down, in chronological snobbery, upon the earlier ages. For others, it served explicitly to associate Christianity, as a whole, with anti-intellectualism and reaction. More recently, it served the notion that Islam transmitted classical learning through the Middle Ages.

Author Michael Keas examines the Dark Ages myth and finds it wanting. He describes the medieval invention of the university. The University of



Bologna, the oldest university in the world, was founded in 1088, those at Paris and Oxford before 1200, and more than 50 others by 1450. The papacy supported this intellectual ferment. Far from ignoring ‘pagan science’ as the Dark-ages myth alleges, the universities embraced it, as elaborated by Keas:

“Between 1200 and 1450, hundreds of thousands of university students studied Greco-Arabic-Latin science, medicine, and mathematics—as progressively digested and improved by generations of European university faculty” (p. 37).

The Christian worldview gave birth to science and discouraged scientism

Keas comments:

“Hawking, Sagan, and Tyson seem unaware that belief in the

Judeo-Christian God actually *supported* the idea that the universe is predictable and knowable as a law-abiding system, which is foundational to science. In this case theology got it right first, and then successful scientific endeavor followed [emphasis is in original]" (p. 164).

The author adds:

"As we dig deeper into the foundations of science, we see that Christianity cultivated both humility and confidence in human knowledge. That confidence derived from the orderliness of God's world, designed for discovery by his human image bearers. Belief in God as the universal law giver encouraged investigation of nature to discover natural laws ..." (p. 194).

At the same time, the Christian worldview prevented science from degenerating into intellectual arrogance and scientism. Keas notes:

"The Christian doctrine of the Fall of Adam and Eve (and our status as finite creatures) provided an explanation for the difficulty of human reason in achieving certainty about the cosmos, with a consequent emphasis on the testing of hypotheses. Many medieval and early modern scientists embraced this balance of confidence and humility" (p. 194).

The miraculous is fully compatible with science

Keas continues:

"The materialists' criticism of miracles in the Judeo-Christian tradition misses the mark. Those criticisms fail to recognize that the very notion of a miracle—a *rare* divine sign—would be inconceivable without the companion idea of nature's regularity [emphasis is in original]" (p. 194).

Notice that this dispenses with the trivial argument of some compromising evangelicals. They would have

us believe that belief in a miraculous Creation Week is the same as belief in God intervening in the function of clogged pipes, which the plumber would presumably have to consider. It also counters those who say that belief in miracles is 'unscientific'.

Medieval science was based on authority, and modern science on observation: not quite

Keas writes:

"Although medieval disputations were more focused on debating written texts about nature rather than extensive firsthand encounters with nature itself, even today undergraduate science majors acquire the vast majority of knowledge of nature by interacting with scientific texts. In laboratory course components, the professor and the laboratory manual largely guide students to see and interpret nature in certain ways. I have taught lab-based science for many years and have reflected on that experience as a philosopher-historian of science. Even graduate students doing original research have minds filled with 'texts', whether acquired by reading or by listening to professors and other students. There are virtually no text-free encounters with nature in scientific practice of scientific pedagogy, whether medieval or modern. Of course, one can find differences in how science is practiced and taught depending on the historic period, the particular field of science, and other factors, but there is also much continuity in the human condition in the face of nature. Making too sharp a distinction between medieval science and modern science is erroneous" (p. 211).

Nor is it true that, in more recent times, the church was allergic to scientific observation. Keas writes: "Furthermore, there is no record of priests or theologians refusing

to look through a telescope. In fact, when Cardinal Bellarmine asked about Galileo's telescopic discoveries, the Jesuit astronomers at the Roman College *confirmed* their accuracy [emphasis is in original]" (p. 88).

Columbus and the flat earth myth

Many textbooks teach that, until Columbus and especially Magellan, Earth was believed to be flat. This is egregiously untrue. Ever since the 4th century BC Greeks, the dominant view was that Earth was round. Dissenters, such as John Chrysostom (incorrectly accused, by Keas, of a flat earth view), Theodore of Mopsuestia, Cosmas Indicopleustes, and Lactantius existed, but they were decidedly a tiny minority (pp. 48–49).

Fernando, the son of Christopher Columbus, wrote about potential objections to his father's voyage. Sailing off a flat Earth was not one of them! The chief objection was not Earth's shape but its size: it would take three years to reach the Far East from Western Europe. (If North and South America did not exist, as believed before 1492, such indeed would have been the case. The Indian-Pacific-Atlantic would form one vast, uninterrupted ocean, covering most of Earth's surface, which would have to be crossed.)

Giordano Bruno was a bombastic, run-of-the-mill heretic, not a hero for science

Bruno's 'scientific' ideas were hardly original. A century earlier, Bishop (and future Cardinal and papal legate) Nicholas of Cusa (1401–1464) had suggested an infinite universe (p. 149). Nicholas also upstaged Bruno on the premise that the stars were like our sun (p. 150). Bruno himself

acknowledged his debt to Nicholas, calling him “the divine Cusanus”.

Keas adds that:

“Kepler expressed disgust over Bruno’s execution, but he recognized that this man was burned alive for his pantheistic infinite universe (and more), not for a scientifically testable idea. Indeed, Bruno’s infinity of worlds fell woefully short of Kepler’s rigorous standard of testability” (p. 169).

The main issue was Christocentric theology. Keas cites the philosopher of science, Thomas S. Kuhn, and his book, *The Copernican Revolution*, in which the latter comments:

“Bruno, the philosopher and mystic ... was not executed for Copernicanism but for a series of theological heresies centering on his view of the Trinity, heresies for which Catholics had been executed before. He is not, as he has often been called, a martyr of science” (p. 57).

In terms of specifics, “Bruno rejected the historic Jesus, the Trinity, as well as other key components of Christian theology” (p. 73).

Author Keas adds:

“Bruno was on the fringes of respectable astronomical company. Small wonder that Oxford scholars ran the boastful migratory philosopher out of town after his lectures there. In fact, just about everywhere Bruno went he quickly wore out his welcome. His heretical beliefs provoked his serial excommunication by Catholics, Calvinists, and Lutherans (in that order). But some of his migratory behavior came from Bruno’s eruptive habit of mocking almost anyone with whom he disagreed Although Bruno might stand legitimately as a tragic hero for free speech, his cosmic speculation contributed very little to the long-term growth of science” (p. 72).

Galileo’s dogmatism, and not his ideas, got him in trouble with the Inquisition

Keas writes:

“Jole Shackelford explains that ‘the Catholic Church did not impose thought control on astronomers, and even Galileo was free to believe what he wanted about the position and mobility of Earth, so long as he did not *teach* the Copernican hypothesis as a truth on which Holy Scripture had no bearing [emphasis is in original]’” (p. 61).

Even though, in hindsight, Galileo was proved right, he was aggressively confronting the church with a certitude that was unjustified by the science of the time. Keas comments:

“The cardinal [Robert Bellarmine] was also correct in thinking that the Copernican system had not yet (in 1615) been proved beyond reasonable doubt. Even in 1633, when Galileo was put on trial, most scientists questioned sun-centered astronomy. Only much later did the Copernican system advance to a position beyond reasonable doubt” (p. 81).

During this time, there were three systems in play: the Aristotelian/Ptolemaic (where all sun, stars, and planets orbited Earth), the Copernican (where they all orbited the sun), and the Tychonian (where all planets except Earth, orbited the sun, and the sun, in turn, orbited Earth as did the stars and the moon). Note that, in both the Aristotelian and Tychonian systems, Earth is stationary. That was the sticking point.

Keas writes on the competition between the three systems:

“If Galileo had been more tactful, modest, and patient in his attempt to reform his own church, there might have been no trial in 1633. Minority scientists such as Galileo argued that a heliocentric cosmos was scientifically superior. But given the scientific data available through 1633, the Copernican system *not*

yet been shown to be superior to the Tychonic system of astronomy. Tycho Brahe’s theory included many of the most defensible parts of the other two theories, and was endorsed by the Jesuit astronomers of Rome [emphasis is in original] (p. 89).

Keas elaborates:

“Contrary to Robinson, early modern astronomers resisted a moving Earth chiefly for scientific, not theological, reasons. During Galileo’s career, Tycho Brahe’s geoheliocentric system was widely believed to best fit prevailing physical theory and telescopic observations such as the phases of Venus, as explained in Chapter 5” (p. 96).

“Additional strengths at the time included: the Tychonic system expected a *lack* of stellar parallax and better made sense of the presence of detectable stellar widths. Both of these strengths were later erased by better technology and new scientific discoveries. Even so, at the time, the Tychonic system was very well supported by the evidence [emphasis is in original]” (p. 216).

‘Copernicanism demotes humans’ a straw man, and a recently formulated one at that

At no time was the Copernican system ever condemned as a threat to human uniqueness. Keas comments:

“Cardinal Bellarmine’s pivotal April 1615 letter, examined in Chapter 5, never claimed that Copernicanism challenged human dignity. This leading Catholic theologian wrote in opposition to Copernican astronomy as an unproven theory that seemed difficult to reconcile with biblical descriptions of the sun and earth” (p. 96).

Keas shows that this whole notion was a recent invention. He

surveyed nine astronomy textbooks found in the Harvard College library, published between 1656 and 1769, and found:

“These textbooks exhibit some striking features in their treatment of science and religion. They promote neither the Copernican demolition myth nor any of the other myths about warfare between science and Christianity that we have surveyed” (p. 175).

The author additionally surveyed many more recent books and concludes:

“The idea that Copernicus demoted humans and thus challenged religion emerged in the mid-seventeenth century as part of an invented anti-Christian narrative. By the mid-nineteenth century the myth had entered astronomy textbooks, and by the second half of the twentieth century it had become textbook orthodoxy” (p. 94).

More on the myth of the demotion of man

Perhaps this is the most perennial anti-Christian straw man. According to it, the historic and Christian view of man and the universe, from the beginning, was that of a cozy little universe in which human beings were central. This myth is promulgated by the likes of Bill Nye ‘the science guy’, countless textbooks, and the *Cosmos* series of television programs.

In actuality, neither Judaism nor Christianity ever taught that humans are central. In fact, the opposite is true! See Psalm 8. As a further irony, geocentric astronomy also failed to exalt man! Keas comments:

“The myth that Copernicus demoted humans assumes that pre-modern geocentrism (Earth-centered astronomy) was equivalent to anthropomorphism (human-centered ideology). But according to the ancient Greek geocentric viewpoint that was commonly accepted through

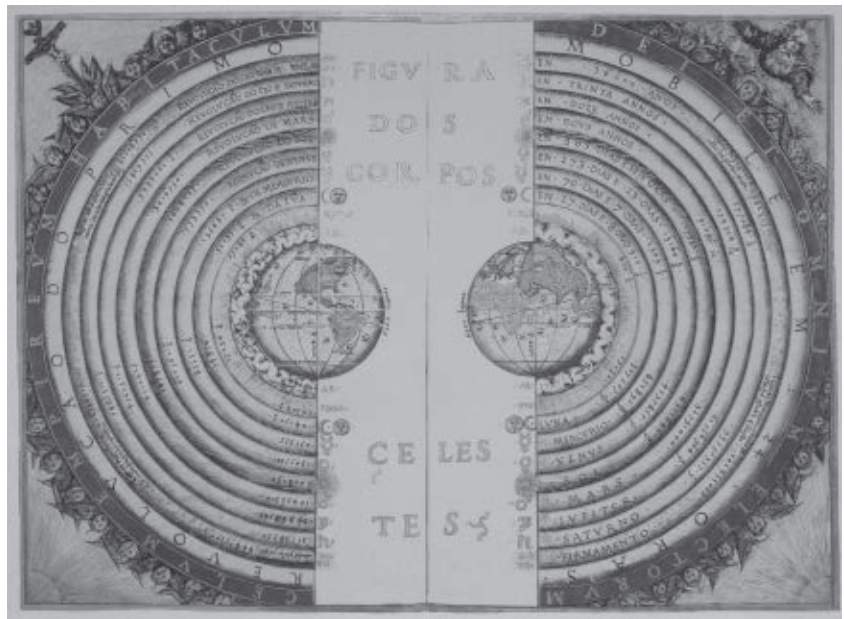


Figure 1. Irony to the ‘Copernicanism dethroned man’ notion, the old Ptolemaic system already had long demoted planet Earth.

the time of Galileo Galilei (1564–1642), Earth was at the *bottom* of the universe. This was no honor [emphasis is in original]” (pp. 92–93). (figure 1)

Nor did the increasing size for the universe, as it became ever-apparent, translate into a progressive diminution of humans. Keas elaborates:

“In seventeenth- and eighteenth-century English astronomy literature, I find no indication that the increasingly larger estimates of cosmic dimensions became grounds for debilitating doubts about human significance. In fact, one of the most quoted biblical passages in eighteenth-century astronomy literature is Psalm 8:3–5” (p. 18).

Finally, significance should never be conflated with size. Keas asks what is more important: a human baby, or 1 million cubic miles (4.2 million cubic km) of interstellar space! (p. 184)

Carl Sagan projected his own teenage rebellion against God onto science

The most modern incarnation of the ‘science has dethroned humanity’ myth

is promulgated by the late Carl Sagan’s 1980 *Cosmos* series, watched by over a half billion people (that’s more than any preacher!) This gospel according to Sagan has been remade in 2014, with a 2019 follow-up, and with other series having a similar theme (*Star Trek* and *Next Generation*). Carl Sagan boldly said: “The cosmos is all that is, or ever was, or ever will be” (p. 139).

In other contexts, Carl Sagan has portrayed Kepler as one struggling in despair about God, something which is contra-indicated in Kepler’s works. It appears that Sagan is projecting his own adolescence onto Kepler and unto the universe. Sagan grew up in a home with a religiously indifferent Jewish father and a kosher Conservative Jewish mother. As a teenager, Carl Sagan had vehement arguments about God with his mother as part of his rejection of theism (p. 158).

Historical deficiencies in the *Cosmos* series: the end justifies the means

One historian and philosopher of science, Joseph D. Martin of the

University of Cambridge, agreed with many of the criticisms of the *Cosmos* series (pp. 152–153). However, he justified the falsification of history “in service of a greater truth” and “in order to promote greater public trust in science”. In other words, the main thing is the promotion of an agenda. But does the promotion of falsehood enhance ‘greater public trust in science’ (in Joseph Martin’s exculpatory words), or does it do precisely the opposite?

‘No God seen in space’: an invention of Communist propaganda

The widely quoted account of cosmonaut Yuri Gagarin saying that he “saw no gods or angels” while orbiting Earth, though often reported as fact, is not. (Not that it would really matter.) Gagarin’s colleague, Colonel Valentin Petrov, reported in 2006 that the Communist Party had fabricated the story, as part of its exploitation of early Soviet space successes, to advance Communist narratives (p. 197).

Artificial intelligence (AI)—an extension of the demotion of man

To what extent can computers duplicate human intelligence? There is an ‘arms race’ of sorts going on. Not only is AI advancing and even ‘rewriting all the rule books’, but so is our understanding of human intelligence itself! Keas comments:

“Singularity skeptics Alessio Plebe and Pietro Perconti make a related point about aspects of human intelligence that appear to be beyond AI emulation. In recent decades, cognitive scientists have discovered that human intelligence is much more multifaceted than previously thought. They have identified many kinds of intelligence and are proposing still more, ‘from

emotional to musical, from spatial to social’. So ‘the number of aspects one has to take into account’ multiplies with each new advance in cognitive science. Consequently, research in AI ‘heads more towards a slowdown rather than towards a singularity effect’” (p. 119).

Extraterrestrial Life (ET)—a further extension of the demotion of man

Much is said about life being found elsewhere in the universe, and skeptics almost wish for it to be true in order to finally discredit religion, and especially the teachings of Christianity on Jesus Christ dying on the Cross to save man (John 3:16).

The potential existence of extraterrestrial life, far from being the death knell of Christianity, has long been contemplated by Christian thinkers. Nicholas of Cusa not only allowed for extraterrestrial life, but for intelligent extraterrestrial life. Far from being condemned as a heretic, Cusa was made into a cardinal (p. 65). Basil conceived of God’s ability to make many ‘heavens’ or ‘worlds’, although he personally did not support this view (p. 213). Kepler believed in ET (pp. 168, 169), and rejected the notion that it diminished biblical human significance (p. 94).

Ironically, even the discovery of highly intelligent extraterrestrial life would not discredit Christianity. At least Keas does not think so. He sagely notes:

“The idea that God can take apparently insignificant persons (humanity, Israel, or the Christ child) and do great things through them that will silence his foes. Even if humanity on a cosmic scale is no more than an infant, overshadowed by perhaps older and wiser alien civilizations, this does not preclude human significance in a Biblical sense” (pp. 184–185).

Having said all this, one must keep in mind the fact that the challenges to the existence of extraterrestrial life are formidable. Only parts of galaxies (the GHZ—or ‘galactic habitable zone’) are potentially suitable for life. In addition to location within the GHZ, there are very special conditions for the presumed emergence of life, even within an evolutionary context, as summarized by Keas:

“‘Just right’ factors include the right location within a galaxy, right kind of host sun, right distance from host sun, right orbital relations to Jupiter-like planets, right kind of protection from being hit in a life-destructive way by space objects (e.g. asteroids and comets), right kind of protection from harmful radiation, right kind of reception of life-friendly radiation, and the right amounts of liquid water” (p. 113).

Conclusion

The author summarizes his book (p. 185). We have the ‘Dark Ages’ myth of the medieval Catholic Church suppressing science, which is strongly promoted by Carl Sagan’s *Cosmos* series. Then people before Columbus are made out to believe that Earth was flat, all thanks to church-sponsored ignorance. Giordano Bruno is transformed into a martyr for science, and the Galileo affair is distorted. Finally, there is the oft-repeated Copernican demotion of man.

Author Keas has demolished all these myths. Moreover, following his extensive survey of old and new textbooks, he concludes: “None of the textbooks published before 1789 contained any of these myths” (p. 185). In contrast: “About 79 percent of currently used college astronomy textbooks contain at least one of these myths” (p. 186).

Darwinists still trying to refute Behe and still failing

Darwin Devolves: The new science about DNA that challenges evolution

Michael Behe

HarperOne, New York, 2019

Jerry Bergman

Professor Michael Behe (figure 1) introduces his work by noting that virtually everyone, including scientists, at least in the West, accepted the fact of Intelligent Design (ID) in the natural world until Darwin's work popularized evolution theory, largely replacing ID.

One of the most well-known exceptions was David Hume (1711–1776), who rejected ID because “in order to think that our world [and life] was designed, we would need to have much experience examining [life on] other worlds that have been designed” (p. 4).

We now have a great deal of experience examining other worlds,

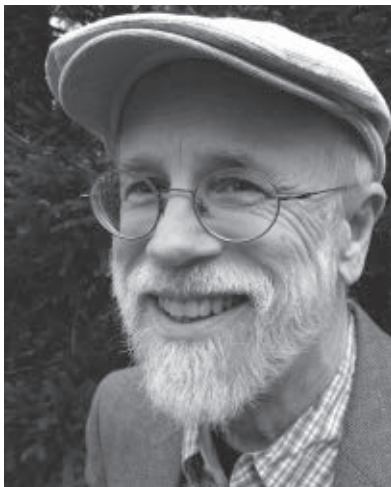


Figure 1. Michael Behe, Tenured Professor of Biochemistry at Lehigh University who documents numerous lethal problems with Darwinism.

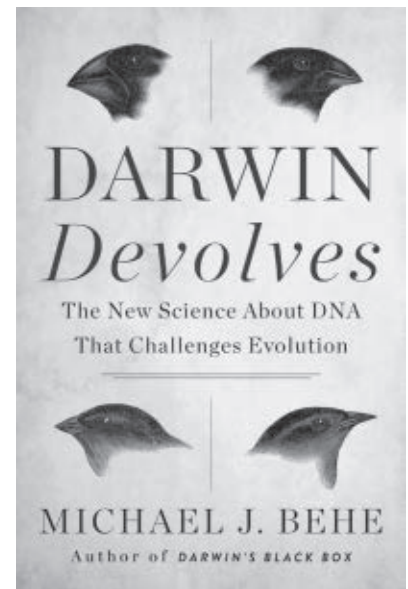
namely the seven planets and over 100 planetary satellites in our solar system. We know from these comparisons that, in contrast to every other planet in our solar system, we clearly live in a world specifically designed for life. And from recent research on stellar systems outside of our own, we know that this is true for most of the universe that we have been able to explore by technology from Earth.

Even after Darwin, “most biologists of his day were skeptical of Darwin’s proposed mechanism of evolution”, natural selection, for decades (p. 4).

Some background on Behe

Behe relates that in his K–12 Catholic education, Sister Marie taught her class that “the best evidence these days shows that evolution is correct” (p. 6). He studied chemistry in college because he “wanted to know how the world *worked*” and ended up in biochemistry, the chemistry of life. Along the way he also studied evolution (p. 7). After completing a Ph.D. at the University of Pennsylvania, he did a postdoc at the National Institutes of Health (NIH). All during this time he accepted evolution as the only explanation for all life on Earth.

This brief introduction was designed by Behe to deal with the common misperception that those who reject Darwinism are mostly religious fundamentalists, indoctrinated in creationism by their church. Furthermore, the common belief is that they are not only ignorant, but dangerously evil. He illustrates this claim of irrational hatred against someone who has the audacity to question Darwinism with several examples. One, in an article published in the journal *Biology & Philosophy* authored by Duke University



Philosophy Professor Rosenberg places Behe in the same category as some of the most evil persons who have ever walked the surface of the earth, Stalin (figure 2) and Osama bin Laden (p. 5).

Behe’s personal path from never questioning evolution to being an insistent questioner resulted from becoming angry when he realized that none of his professors had ever critiqued Darwin’s theory, even once, but naively accepted the Darwinian worldview without bothering to examine it in any detail. Behe’s turn-around came after he read Michael Denton’s book, *Evolution: A theory in crisis*, and realized that serious problems existed with the theory. He then began his current quest to research and study the data for himself to determine what the evidence actually shows (p. 8). Although Denton’s childhood exposure to creation probably influenced him to not completely buy into the party line on this subject, Denton was not trying to push a religious agenda in his chapter, only explaining the well-documented scientific problems for evolution.¹

Once his Darwinian glasses were taken off, Behe, as a biochemist, was able to discern quite easily that the molecular foundation of life was elegantly designed and that an

unintelligent, undirected process cannot account for the origin and design of life (p. 9). The main point of Behe's book is to document this fact, adding that rather than building life, "mutation easily *breaks* or *degrades* genes, which, counterintuitively, can sometimes *help* an organism to survive, so the damaged genes are hastily spread by natural selection" (p. 10). In short, "Darwinian evolution proceeds mainly by 'damaging' or 'breaking' genes, which, counterintuitively, sometimes helps survival" (p. 46). Thus, "Darwin's mechanism works chiefly by squandering genetic information for short term gain" (p. 48).

Comparing evolution with economics, Behe noted if economists' ideas are wrong, many people could suffer and, as a result, people will become angry for good reason. But evolutionary stories, such as fish that grow legs and walk on land, and dog-like mammals that once walked on land lose their legs and evolve into whales, "get so much uncritical gee-whiz-that's-neat media attention that it can be hard for readers to spot serious problems lurking just below the surface" (p. 22). In addition, tearing apart evolution's just-so-stories can bring the charge of 'creationist' or worse, causing career difficulties or even ending of a career.

Furthermore, many people, scientists and journalists alike, logically or illogically tend to plant the word evolution everywhere they can. An example Behe gives is the simple statement "Humans have evolved a sense of self that is unparalleled in its complexity" (p. 23). The same statement "Humans have a sense of self that is unparalleled in its complexity" is, in contrast to the former statement, incontrovertible. The evolution of the complexity of life from simple molecules by mutations is accepted, not because we have any clear empirical evidence, but because evolutionary claims saturate our culture, especially in the mass media, including in textbooks, popular books, novels,

magazines, and even movies and fiction literature (p. 24).

Although, Behe stresses, evolution claims are ubiquitous, they are claims only, not evidence. An example is the theme of my latest book on the claims of poor design.² (A common example is the false claim that humans have back problems because we evolved from quadrupedal creatures who evolved to walk on all four appendages, and humans were forced to 'make do' with a design that did not evolve to walk on two feet, but rather on four.)

Most critics of Behe carelessly confuse evidence for common descent for Darwin's mechanism. Many critics cite "millions of years prove ..." or "the fossil record shows ..." as proof of their position, but virtually all of these arguments can, at best, only show evidence for common descent, such as the many modern dog breeds created by breeders throughout history, but say nothing about the *mechanism*, which is the key argument of Behe's book (p. 289). Specifically, he reviews the scientific evidence that shows what random mutation plus natural selection can actually achieve.

Behe argues it is not evidence that causes people to believe that evolution does all kinds of wonderful things, like turning dumb apes into intelligent men, but rather what is called in sociology *groupthink*, which has mesmerized the public and scientists alike. Attach the name 'science' onto some claim and it implies the claim is fact. Behe gives three nutrition examples that have been pushed for decades and are still widely believed, but which have turned out to be incorrect. These are, consuming foods high in fat, cholesterol, and salt are major contributors to heart disease, strokes, and cancer. We now realize these nutrients "may not significantly ... increase the risk of heart disease: but high levels of sugar can" (p. 27).

As Behe notes, if nutritionists "can't easily determine how one particular diet factor affects modern humans," in spite of leading academics

spending hundreds of millions of dollars researching this question using millions of intelligent subjects, often doctors and nurses, then the claim that evolutionists "know which—if any—of countless environmental factors drove evolutionary change in innumerable organisms in the distant past is ludicrous" (p. 28).

The poor design claim

Chapter 2 covers the poor design argument, the belief that certain parts of our body are poorly designed, such as the eye's retina, which Behe disproves by noting that each cone cell has its own dedicated fibre-optic cable attached to it, which efficiently channels the specific wavelengths of light to the cones that are sensitive to that wavelength (p. 50). Furthermore, lack of what someone judges as some ideal concept of perfection does not disprove design. Requiring perfection does not negate evidence for design. My Apple computer and my Jeep Cherokee are not perfect machines and have what I judge as minor design flaws, but such does not disprove the fact that they are designed (p. 49).

Other examples in this chapter include magnetotactic bacteria that use magnets to navigate their environment, bacteria that traverse their world by rotating tractor-like treads, mobile bacteria that move around by centipede-like legs, and other bacteria that move by using oars to paddle their way around their watery world (pp. 51–58). Also covered are irreducibly complex systems, such as *regulatory DNA* discovered by Jacob and Monod, and *alternative splicing*, whereby a single 'gene' can produce hundreds of different transcripts, thus coding for hundreds of different proteins by employing a spliceosome (pp. 58–63). Lastly, *protein scaffolding* and *insulators* are covered, all mechanisms that advanced biochemistry students study. In chapters 3, 4, and 5 Behe documents the evolutionary attempts to explain the origin of the machinery,



Figure 2. Duke University Philosophy Professor Rosenberg places Behe in the same category as one of the most evil persons who have ever lived, Joseph Stalin (pictured here at age 23). Ironically, this is because of Behe documenting the problems with what is actually the core of Stalin's worldview, Darwinism.

motors, and complex systems discussed in chapter 2, all of which explanations fail.

Chapter 4 reviews the amazing progress made in sequencing genomes of a wide assortment of life kinds. Because the sequencing results are published online, a new breed of scientists can make a living by analyzing this data from their home. Some of these genetic analyzers have concluded “in no uncertain terms ... their work shows Darwin was dead wrong ... about his image of the tree of life” (p. 103). Behe also does an excellent job reviewing the many major problems with the *multiverse*, and *self-organization* theories (pp. 114–115).

Principle of Comparative Difficulty Concept

The Comparative Difficulty Concept idea is, if a task that requires a small amount of effort is too difficult to accomplish by natural laws alone, such as the origin of the spliceosome, then a task that requires more effort, such as the origin of mitochondria, is also too difficult to achieve by natural laws alone (p. 28). Unable to explain

the origin of the simpler building blocks for evolutionary change, such as the origin of many critical polypeptides, many Darwinists jump to over-arching explanations for what they *believe must* have happened in evolution in order to obtain the many life forms existing today, but if

“... modeling even minor evolutionary effects is quite problematic, then the types of studies done by Stuart Kauffman, Andreas Wagner, and many others—which hope to account for massive evolutionary changes that occur over lengthy time frames—are simply pushing mathematical tools far past what they already labor unsuccessfully to explain. Mathematical models can’t explain greater evolutionary changes if they can’t account for lesser ones. They yield only a pretense of knowledge” (pp. 113–114).

Chapter 5 likewise covers why the ideas created to save Darwinism, including extended evolutionary synthesis, evo-devo, neutral evolution, facilitated variation, inclusive inheritance, niche construction, developmental plasticity, natural genetic engineering, and game theory, have all failed (pp. 115–137). The existence of these theories clearly demonstrates the failure of neo-Darwinism and illustrates the quandary molecules-to-man evolution faces today.

Behe does not cover the problems with dating, but assumes that the conventional time used by evolutionists is correct—possibly because he has not studied this area in the depth he has studied biochemistry.

In chapter 6, Behe cites numerous detailed studies designed by evolutionists to prove evolution, but which actually do the opposite. For example, the Galápagos finch research by the Princeton husband and wife researchers, Peter and Rosemary Grant, who spent decades measuring and observing the behaviour of thousands of individual finches (p. 144). The severe droughts on one island tended to cause most plants to become dormant, or

at least produce fewer seeds, or stop producing seeds altogether. The seeds remaining tended to be larger and tougher, which is the plants’ response to survive drought conditions.

The finches that survived the drought tended to be larger both in body and beak size in order to break the larger and tougher seeds. Most finches could not survive these conditions, and consequently 85% of the medium ground finches died. The Grants found, as expected, on average the finch offspring had larger bodies and beaks, as did the offspring’s offspring. According to Darwinists’ estimates, the founding birds arrived two million years ago and soon split into several species (p. 146). In short, extrapolating from this finding by the Grants, by comparing the variety of finches on the islands that supposedly descended from the original population of a few finches, leads a person to conclude that if the speciation the Grants observed had actually “been going on for about a million generations ... involving a cumulative total of billions of birds”, the results were only very minor variations in body length and beak size, “and not much else” (pp. 146–147). The beak size variation the Grants found was about 5–6%, a very small amount of the tiny finch beak. All of the descendants of these few birds after the claimed millions of years “remain recognizable finches”, most which can interbreed, producing hybrid finches, some of which, the Grants reported, are more vigorous than the parent populations. Furthermore, interbreeding has been so frequent that at least one breed has disappeared from the islands.

Behe cites a report that the observed six species of ground finches are actually one species. Thus, rather than 14 total species, there are far fewer, possibly even one (p. 147)! Furthermore, this study, one of the most detailed evolutionary studies ever completed, found that millions of generations and billions of birds produced only minor swings of a few

traits, and no new trait. In Behe's words,

"If millions of years of such intense selection on finches as documented by Peter and Rosemary Grant can't produce anything other than a finch, then what reason ... is there to suppose it could produce significant new variations on a preexisting flagellum?" (p. 290).

Natural selection

Behe concludes that natural selection operates very differently than has heretofore been theorized. It powerfully helps to narrow and focus traits to a current environmental niche regardless of what might actually be in the best long-term interest of the species. Evolution is unguided, has no goals, and can't plan for the future, but its putative power results from eliminating useless and/or wasteful traits. Once these changes are fixed in the gene pool, mostly due to having lost prior genetic information, the species is now often less able to adapt to major environmental changes because the animals' ability to handle major changes is now narrower than earlier.

What was culled from the genome is likely lost forever, and random mutations will rarely, if ever, be able to reverse/undo what was lost because "selection fits a system more and more closely to its current biological task, ... but that makes it more and more difficult to adjust to other potential functions." (p. 227). Furthermore, what Behe calls the First Rule of Adaptive Evolution is as follows:

"The amazing but, in retrospect, unsurprising fact established by the diligent work of many investigators in laboratory evolution over decades is that the great majority of even beneficial positively selected mutations damage an organism's genetic information—either degrading or outright destroying functional coded elements" (p. 183).

If any version of evolution causes changes above the genus level,

it must do so at the biomolecular level. And, Behe points out, due to major genetic innovations over the past few decades such as gene sequencing, we can now finally peer into this black box and determine what exactly is occurring at the biomolecular level. Behe's summation of the problems irreducible complexity (IC) poses to Darwin's mechanism include pointing out that irreducibly complex

"... systems are quite resistant to gradual construction by an unguided process such as Darwin's mechanism, and since there is no plausible evidence to show that they can be so constructed, it is reasonable to conclude ... that random mutation and natural selection did not produce the molecular machines of the cell. ... When we leave imaginative scenarios behind, in the real world Darwin's mechanism has profound problems even with biological features that are much simpler than a mousetrap" (p. 233).

This fact is what actually makes the double-edged sword of natural selection far more powerful and operational far faster than previously thought. And this is what renders its oft-ignored twin blade (mutation) very limited in what it can actually do, in the long run, to evolve a species. Many ways exist to damage a complex machine, but very few ways to improve it. And since mutations are mostly random (though often occurring more frequently in so-called 'hotspots') they are far more likely to mess up or degrade the biomolecular machine than they are to occur in the very few possible places in the genome that could be changed to improve it:

"... it's not so much the rarity of constructive mutations that undermines Darwinian evolution—it's the frequency of damaging but helpful ones. Degradative but adaptive loss-of-FCT [Functional Coded element] or modification-of-function mutations appear quickly even on short time scales, even in small populations. They don't need large

numbers or long times to occur. Thus they will always be present everywhere in life much more quickly and in far greater numbers than constructive gain-of-FCT mutations. Damaging yet beneficial mutations will rapidly be selected when nothing else is available and compete fiercely with any gain-of-FCT mutations that might eventually arrive on the scene" (p. 186).

A 'gain-of-FCT' adaptive *mutation* is one that produces a specific, new, functional coded element while at the same time aiding adaptation of the organism to its environment. This includes construction by *mutation* of a new promoter, intron/exon splice site, and protein processing site.³

Many of the arguments against Behe include the claim that his ideas are creationist rhetoric, not science, by claiming he is arguing that "God did it". Ironically, many reputable scientists use the same argument, only reverse it, claiming "God wouldn't have done it that way", basing their "conclusions almost completely on a sort of reverse theology. What God would or would not do is not within the competency of science to inquire" (p. 290).

In chapter 9 Behe expands on the IC concept with the 'comprehensively complex' systems and 'Mini-IC'. The basic idea is that, as one moves research analysis closer to the biomolecular level, many of the IC systems Behe discussed in his first book are actually made up of many Mini-IC systems. Not only are the parts IC, but so also are the mechanisms that must identify and supply the proper raw components in the right proportions at the right locations at the proper time in the proper order to function.

All of the key concepts of this book are, of course, interwoven and expanded on. None of these systems could have been produced one step at a time even in the case where each step was an improvement that was useful enough to be retained in the genome. This task was much easier in Darwin's day when the details of the complexity

of the many cell organelles, molecular machines such as ATP synthase, and various motors including kinesin, were largely unknown. The lack of knowledge of the cell's workings was the theme of Behe's first book, appropriately titled *Darwin's Black Box*. In short,

"The appropriate straightforward criterion is this: if there are good physical reasons to think Darwinian routes wouldn't work, and if after a diligent search no evidence is found that they do, then the [evolution] theory has failed" (p. 232).

Richard Lenski's research

Lenski's over three-decades-long lab experiments dealt with tracking genetic changes in 12 initially identical populations of asexual *Escherichia coli* bacteria since 1988. The populations reached the milestone of 50,000 generations in 2010. The purpose is to show what random mutations, plus unguided natural selection, can achieve.

The results show that, after tens of thousands of generations and multibillions of bacteria, they are all still the same species, identical in most ways. Few, if any, substantive changes have occurred. As shown by the latest technology used to compare genomes, virtually all of the changes, even those that appear to add new functionality, occur by subtracting existing genetic information, not by the addition of new information. Thus no 'gain-of-FCT' occurred. The Darwinian mechanism does not occur in the direction so many people have assumed since Darwin's *Origin of Species* was published.

Behe also points out other examples that found the same result as the Lenski research, such as the African cichlid population whose time in their natural lake home was supposedly 500 times longer than Lenski's bacteria were observed, i.e. 15,000 years. After all that time, all the cichlid varieties are still in the same family. Behe also cited the Lake Malawi cichlid study that produced a few million estimated

years of random mutation and natural selection, and the Lake Tanganyika study that produced an estimated 10 million years, or about 333,000 times longer than Lenski's in-lab results. These studies, contrary to the goals of each study, have provided no support for any type of evolutionary change beyond the genus level.

If nobody can point to contrary biomolecular evidence, then Behe's argument stands. As he explains, the reality today, at least for the short term, is that the facts boil down to who can tell the best story, or who has the most power to control what is presented and taught as truth in the universities and in the media; actual truth be damned.

The appendix, one of the most important sections of the book

In the appendix to *Darwin Devolves*, Behe documents that his irreducible complexity concept, first introduced in *Darwin's Black Box* (figure 3), has not been refuted, even slightly, in the two

decades since his book was published. He reviews details of the attempts to refute it, then does a masterful job responding to the claims, writing:

"Twenty years on, there has been a grand total of zero serious attempts to show how the elegant molecular machine [the bacterial flagellum] might have been produced by random processes and natural selection" (p. 287).

Many critics have 'refuted Behe' by using lots of words, but anyone can 'refute' by declaring 'that just ain't so'. A scientific refutation requires more than just imagination and typing. One example Behe cites is the blood-clotting system.

The blood-clotting claim of irreducible complexity refuted?

After several articles were published in the scientific literature claiming the IC claim for the blood-clotting cascade mechanism had been refuted, Behe observed that the system must control where and when coagulation occurs, and prevent clotting from occurring too easily, causing heart attack, stroke, or pulmonary embolism, to name the more common results or not clotting rapidly enough, causing internal or external hemorrhaging (p. 295). Furthermore, the clot must be removed soon after its role has been served, and not before. Behe proposed that if one part of the system is removed, this finely tuned cascade will break down, causing failure of its complex function, and thus catastrophe. In response to Behe's claim, the then leading expert in blood clotting, Professor Doolittle, announced that the mechanism was not IC and that "parts of the clotting mechanism could be removed from mice with no ill effects" (p. 295). In short, when one protein is disabled, namely plasminogen, mice have one set of problems, and when fibrinogen is disabled, another problem results. But if *both* are removed mice are normal, indicating that the mice do not need the genes making the protein set, thus the



Figure 3. Behe's first book, that opened the door to the next two books he authored: the one reviewed here, and *The Edge of Evolution: The search for the limits of Darwinism*. All three of his books were commercial successes, although hotly opposed by atheists and orthodox evolutionists.

blood-clotting mechanism is not IC, a conclusion repeatedly stated in articles attempting to disprove Behe.

But it turns out Doolittle misread the paper in question. The mice missing both proteins are *not* normal, but have the same problem that the mice deficient only in fibrinogen had: their blood does not clot properly, and they hemorrhage. The result is females die during pregnancy and, when injured, the mice bleed to death (pp. 296–297). This is a good example of reading into the text what one believes, not what the actual words say. Behe is correct: the blood-clotting system that Behe originally identified as IC is indeed IC.

Conclusion

Behe's *Black Box* book set off an uproar that included "scathing editorials and court trials as well as denunciations by scientific societies, national governments, and even a committee of the Council of Europe" (p. 284). In retrospect, the explicit proposal of Intelligent Design was more the problem than was Behe's criticism of Darwin's theory, or the IC concept itself. Many "scientists and others are viscerally opposed, in principle, to a design-for-life conclusion, and some were spurred to action by it" (p. 284). Behe's latest book will no doubt likewise be opposed for the same reason, even though he has done a masterful job of defending his position, relying heavily on peer-reviewed literature published by leading scientific journals. Each point he makes is unassailable, consequently his conclusion is supported.

References

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3. Behe, M., 'Experimental evolution, loss-of-function mutations, and 'the first rule of adaptive evolution', *The Quarterly Review of Biology* 85(4):419–445, 2010.

Systematic theology with a solid foundation

Biblical Doctrine: A systematic summary of Bible truth

John MacArthur and Richard Mayhue (Eds.)

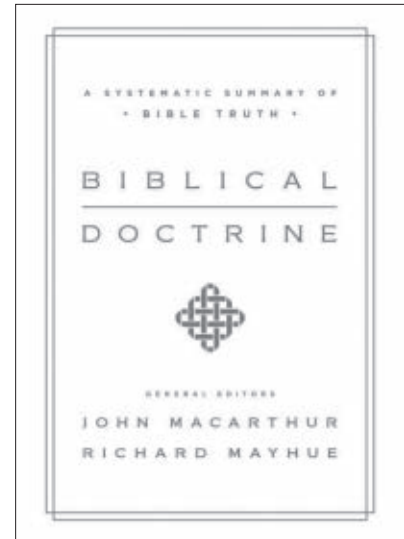
Crossway, Wheaton, IL, 2017

Cody J. Guitard

Ever since the popularization of uniformitarian philosophy and evolutionary theorizing in the 19th century, many otherwise conservative theologians, biblical scholars, and church leaders have taken to reinterpreting Genesis to fit with the mainstream secular scientific paradigms for understanding the origins and history of the universe, the earth, and life itself.¹

Ideas of deep time and even molecules-to-man evolution have seeped their way into a great number of today's Bible commentaries and theology textbooks used in seminaries worldwide to train the Christian leaders of tomorrow.² It is, therefore, immensely refreshing to finally have a recent, well-written, scholarly systematic theology text that unashamedly holds to the biblical history of recent creation and the global flood.³

John MacArthur and Richard Mayhue's *Biblical Doctrine* covers a variety of key doctrines of historic Christian belief, though certainly, of course, with their own theological distinctives. Students of Scripture will greatly appreciate how saturated the text is with Scripture references, showing the text's effort to stay true to its name. It will also be appreciated that the authors do not shy away



from delving into some detailed discussion concerning issues related to Genesis 1–11 that are hotly debated even among biblical creationists, such as the nature of the transmission of Adam's sin to the rest of mankind (pp. 461–466) and the identities of the "sons of God" and the Nephilim in Genesis 6:1–4 (pp. 730–733). However, for the purpose of this review, we will focus on the book's more essential points made concerning the doctrine of creation without explicitly endorsing any other aspects of the authors' broader theology.

A solid foundation for theology

It is a distinctive feature that sets this volume apart from the rest in the long list of modern theological texts that it strongly affirms young-earth (biblical) creation and the fiat creation model in particular. The authors affirm all of its essential components, including but not limited to creation *ex nihilo* by divine decree or fiat over six literal 24-hour (solar) days (defended

most thoroughly on pp. 402–405); the categorization, reproducibility, and adaptability of living things within the confines of the originally created ‘kinds’; the climactic special creation and uniqueness of human beings made in the image of God; an age of the earth of thousands, not millions and billions, of years; and the reality and impact of a global, catastrophic flood (pp. 213–216).

MacArthur and Mayhue rightfully reject the evolutionary account of origins in favour of biblical creation, clearly recognizing both the flaws of the former and the foundational nature of the latter to other biblical doctrines. Such being the case, they affirm the historicity of Genesis 1–11, in whole or in part, throughout their text in various theological contexts, highlighting the foundational relevance of the creation-fall-flood-dispersion narrative to the rest of Scripture (figure 1).⁴ For the purposes of this review, a few points deserve special mention, particularly concerning the authors’ treatment of anthropology, hamartiology, soteriology, and eschatology.

Anthropology

On the creation of mankind in particular, the authors deny that humans are part of the animal kingdom and are descended from ape-like ancestors. Instead, they affirm that the first man, Adam, was literally created from the dust of the earth, that the first woman, Eve, was created from one of his ribs, and that both they and all their descendants were created in the image of God—just as the Bible says (see especially pp. 405–414).

Taking a straightforward approach to Genesis 1–2, they affirm that “God created man not from other beings over eons of time but from the ground on the literal sixth day of creation” (p. 214). All other human beings are descended from Adam and Eve, then from Noah and his family, and then, finally, from the peoples who

dispersed from the Tower of Babel. These collectively had all the genetic potential for the ethnic diversity witnessed within mankind up to today (pp. 439–440).

The authors recognize the non-triviality of human origins in relation to the other teachings of Scripture when they affirm that the historical Adam

“... is foundational for understanding the origin and history of the human race, the nature of humanity, the origin of sin, the beginning of human and animal death, the need for salvation, the basis for historical events in Genesis, the reason for functional order within the church, and even the future existence of mankind” (p. 407).

If we deny the historicity of the opening chapters of Genesis (and, thus, of the Bible), the removal of this historical bedrock of other events in Scripture leaves other Christian doctrines with much to be desired.

Such is the case when it comes to the Gospel—the central message of the Christian faith. MacArthur and Mayhue recognize and rightfully emphasize that the biblical doctrines of sin and salvation only make sense within the context of the historical account of creation and the Fall found in Genesis.

Hamartiology

Drawing from the Genesis creation account, MacArthur and Mayhue affirm that the original creation was “very good” and therefore did not include corruption or death. Rather, these are consequences of sin, which only entered the world when the first man, Adam, sinned (pp. 457, 836–837). They therefore recognize the inherent incoherence of attempts at integrating evolutionary theory with Scripture: “Evolution of the world is ruled out by this assertion [that the original creation was ‘very good’] since evolution *requires decay and death*” (p. 215). Evolutionary theory



Figure 1. Genesis is foundational to the rest of Christian doctrine, including the Gospel itself.

entails millions and billions of years of pain, suffering, and death before humans even entered the scene.

But how could God call his creation “very good” *after* the creation of mankind if the world was already plagued with all these very *bad* things? Scripture explicitly refers to death as an *enemy* to be destroyed (1 Corinthians 15:26), and part of the Christian hope is that we will one day be freed from all pain and suffering (Revelation 21:4). Thus, a consistent hermeneutic would have pain, suffering, and death introduced *after* God declared his creation “very good.” As Scripture teaches, and as MacArthur and Mayhue rightly affirm, death, along with pain and suffering, is “an intrusion into God’s creation” introduced by Adam’s sin and persisting due to the sin of his descendants (p. 435).

Soteriology

In addition to evolutionary theory’s incompatibility with the biblical doctrine of sin, MacArthur and Mayhue also point out that an evolutionary account of origins undermines Christ’s salvific work on the cross. Not only can the evolutionary theory of origins not account for man’s uniqueness, man’s infection by sin, and Christ’s role as *kinsman* redeemer (pp. 403–404), but its denial of the original human pair—Adam and Eve—completely undermines the Gospel message.

The authors rightly note the foundational role the historical “first man, Adam”, and his work plays in the historical “last Adam” (Jesus Christ) and *his* work (1 Corinthians 15:45). For just as sin and death came through the first federal head, Adam, salvation and life come through the second federal head, Christ. The work of the last Adam begins the *reversal* of the work of the first Adam. Commenting on the Apostle Paul’s comparisons between Adam and Christ in these regards, MacArthur and Mayhue conclude:

“If Adam is not a person, then the comparison collapses, including Jesus’ role as the One who represents mankind as Saviour. Rejecting the historicity of Adam truly undermines the Gospel itself” (p. 406).

Thus, the authors clearly highlight the non-triviality of the creation-evolution issue by demonstrating its relevance to the Gospel message itself, and thereby further demonstrating why ministries like CMI exist.

Eschatology

Not only is the history of Genesis foundational to understanding the salvation of mankind, but it is also crucial for grasping the future redemption of *all* of creation. As MacArthur and Mayhue put it: “If one grasps God’s original purposes for man and the creation, then one is in a better position to grasp what is still to come” (p. 832). As they explain further, the Genesis record of an originally “very good” creation that subsequently succumbed to the curse of sin and death leaves us with the eschatological hope or expectation of a new creation freed from the curse of sin and death and restored and regenerated to a “very good” (i.e. perfect) state.

The new creation is the very reversal of what became of the old creation as a result of the Fall and is thus “the actual, thrilling conclusion to a really great story” that began in Genesis (p. 913). The saga of Genesis to Revelation explains the beginning and anticipates the end of the establishment of the kingdom of God (pp. 851–856). As such, it is impossible to fully appreciate God’s revealed truth about the end without first gaining a proper understanding of His revealed truth about the beginning.

Points of contention

Despite a strong affirmation of the various features of biblical creationism and an overall solid treatment of hermeneutical and theological issues

related to the YEC position and the relevant biblical texts, I have several points of contention with the authors.

The maximum possible age of the earth

The authors rightly reject the notions of deep time and “the uniformitarian naturalism of secular scientists” (p. 286) in favour of a relatively recent creation date. However, they mistakenly follow a common view among a number of biblical creationists two or more decades ago, that the Bible allows for the earth and universe to be as old as 10,000 years or more: “The earth is relatively young—*perhaps* less than ten thousand years old [emphasis added]” (p. 216).

However, upon a careful examination of the biblical data (e.g. chronogenealogies, textual variants, etc.), it is clear that Scripture leaves no room for an age of creation of 10,000 years or more. In fact, no matter which textual assumptions are granted for dating certain events and deciding which manuscripts are more reliable, the date of creation only falls in the range of somewhere between 5,665 and 3,822 BC, thus yielding a maximum possible creation date of ~7,700 years ago.⁵ Therefore, it would have been more appropriate for MacArthur and Mayhue to state that the earth is *definitely* less than 10,000 years old.

Creation with the appearance of age?

Another point of contention requires a little background knowledge. The two distinctly YEC models for interpreting the Genesis creation account—and the relevant scientific data—are the fiat creation model and the apparent age theory. Both models affirm the basic precepts of young-earth creationism. However, the apparent age theory postulates that God created everything with the appearance of age so much so that the earth and universe *look* or *appear* to be

millions and billions of years old while in reality only being thousands of years old, while the fiat creation model says that God created everything not with the appearance of age but with *functional maturity* so that trees were created already bearing fruit, and Adam and Eve were created with the physiological maturity to reproduce. But some major differences would include absence of navels in the first couple and no growth rings in the trees. Both of these would have no function, but instead would do nothing but point to a history that never happened: Adam and Eve being attached to mothers, and trees having seasonal growing cycles.

MacArthur and Mayhue rightly affirm “the fiat creationist model as the proper interpretation of the biblical creation narrative” (p. 213). However, the authors confuse fiat creationism with the fallacious apparent age theory, wrongly thinking the two are one and the same: “God created all things *mature*, with the *appearance of age* [emphasis added]” (p. 215). However, as was just explained, the two models are inherently *not* the same. The apparent age theory makes God out to be a deceiver, purposely making things look much, much older than they really are, and having a history they never had, without disclosing this information to observers—and he *does* intend that we make *accurate* scientific observations.

The fiat creation model, on the other hand, points out that age has no appearance but is an *interpretation* of the data that relies on assumptions that, depending on the case, are not always true.⁶ The authors certainly do not believe that God is a deceiver, but if they want to be consistent, then they must clearly distinguish between the ideas of God’s original creation being made with *functional maturity* versus it being made with the *appearance of age*, and accept the former proposition while rejecting the latter.

Science vs scripture?

On the relationship between science and Scripture as it pertains to the Genesis creation account, the authors, expressing their disappointment that so many believers reject Genesis as history, make this peculiar statement: “Even many Christians seriously question the biblical record and strongly prefer *scientific conclusions over the testimony of Scripture* [emphasis added]” (p. 402).

While the context of the passage makes it clear that what the authors mean here by “scientific conclusions” are the ideas of evolution and deep time, their phrasing of this sentence gives the impression of framing the issue within the classic conflict thesis, creating a false dichotomy of science versus Scripture/Christianity. This is certainly not the authors’ intention and the verbiage used is most likely a slip-up on their part.⁷

However, it is, for the sake of clarity, still worth taking a moment to address this issue simply by pointing out that what are at odds in the creation-evolution debate are not science and Scripture but two different accounts of history (i.e. biblical versus secular) and their respective interpretations of the relevant scientific data, each of which is built on presuppositions about the past (e.g. catastrophism versus uniformitarianism).

Thus, it would have been more appropriate for MacArthur and Mayhue to frame the issue not as one of Christians rejecting the biblical record of origins in favour of “scientific conclusions”, but rather as one of Christians accepting the secular account of history over the biblical account of history. This leads to reinterpretations of Genesis that do harm to the text and Christian theology, as the authors made especially clear in their discussions on anthropology, hamartiology, soteriology, and eschatology.

Final assessment

The YEC position not only undergoes intellectual persecution in the scientific community but is becoming less acceptable and tolerable among the elite of the theological and biblical studies communities as well. It is therefore both refreshing and admirable to find MacArthur and Mayhue’s *Biblical Doctrine* taking such an unashamed stance on and defending the soundness and importance of biblical creation. As with any theology text, it is rare for someone to agree with all of an author’s theological persuasions. The same will certainly hold true for this one. Concerning the topic of creation in particular, however, the authors gave an overall sound presentation of the biblical data and theological reasoning behind biblical creation to the satisfaction of any biblical creationist. Though there are a few shortcomings, these are relatively minor. All in all, *Biblical Doctrine* is an excellent and essential resource for the biblical creationist’s library.

References

1. The question of the age of creation does not appear to have been at the forefront of the minds of most Christian writers throughout the first 1,800 years of church history, with the exception of the first few centuries. (Writers in the earlier church period gave greater focus to the date of creation and subsequent chronology as they sought to counter Greek views of deep time and even the eternality and non-contingency of the cosmos. See Richet, P., The creation of the world and the birth of chronology, *Comptes Rendus Geoscience* 349(5):226–232, 2017.) However, those who did broach the subject were unanimous in their understanding of Genesis as describing a special creation event having taken place relatively recently, usually dating it to no earlier than 6,000 BC, with the notable exception of Origen, who dated creation at <10,000 BC. For a brief survey of the history of the interpretation of the Genesis creation narrative (with citations of primary sources), see Sarfati, J., *Refuting Compromise: A biblical and scientific refutation of ‘progressive creationism’ (billions of years) as popularized by astronomer Hugh Ross*, 2nd edn, Creation Book Publishers, Powder Springs, GA, pp. 105–137, 2011.
2. Mortenson, T., Systematic theology texts and the age of the earth: a response to the views of Erickson, Grudem, and Lewis and Demarest, *ARJ* 2:175–200, 2009.
3. MacArthur and Mayhue themselves recognize this as a distinctive feature of their volume on p. 26.

4. Cf. Sarfati, J.D., *The Genesis Account: A theological, historical, and scientific commentary on Genesis 1–11*, Creation Book Publishers, Powder Springs, GA, pp. 69–86, 2015, wherein the author explains the foundational nature of Genesis 1–11 to the doctrines of bibliology, theology proper, Christology, pneumatology, angelology proper, satanology, demonology, anthropology, hamartiology, soteriology, Israelology, ecclesiology, and eschatology. MacArthur and Mayhue’s recognition of the importance of Genesis to biblical Christianity is not surprising as they have discussed and defended it elsewhere. See, for example, MacArthur, J., *The Battle for the Beginning: Creation, evolution, and the Bible*, Thomas Nelson, Nashville, TN, 2001; Mayhue, R., Editorial: scripture on creation, *The Master’s Seminary J.* 23(1):1–6, 2012.
5. Hardy, C., and Carter, R., The biblical minimum and maximum age of the earth, *J. Creation* 28(2):89–96, 2014.
6. Sarfati, ref. 4, pp. 173–177; cf. Wieland, C., The earth: how old does it look? *Creation* 23(1):8–13, 2000.
7. This is evident from their statement concerning the scientific accuracy of Scripture, *contra* the accommodation theory of inspiration: “If God is able to keep the writers free from error at all, such as in writing spiritual truths, then there are no reasonable grounds to conclude that he was unable to secure a factual account of *scientific* and historical records [emphasis added]” (p. 108). They also recommend other resources that *do* argue for the compatibility of science and Scripture, such as Mortenson, T. and Ury, T.H. (Eds.), *Coming to Grips with Genesis: Biblical authority and the age of the earth*, Master Books, Green Forest, AR, 2008 (recommended in a footnote on p. 405).

A biased survey of the history of Genesis interpretation

Since the Beginning: Interpreting Genesis 1 and 2 through the ages

Kyle Greenwood (Ed.)

Baker Academic, Grand Rapids, MI, 2018

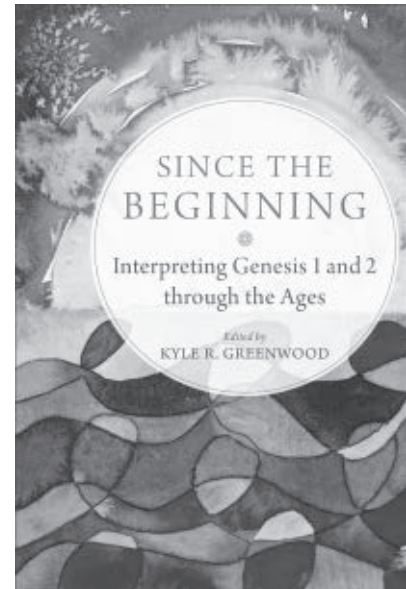
Lita Cosner

Our doctrine of inspiration is primarily Christological, not a result of the academic study of the documents of Scripture. This is because, even if we can point to hundreds of places the Old Testament has been confirmed by archaeological finds and contemporary documents, no amount of proof is sufficient to establish inerrancy. And even if we were able to prove that the biblical documents are completely accurate, that would not mean they were necessarily inspired by God. So Christ’s explicit statement that Scripture cannot be broken (John 10:35), and His authoritative use of the Old Testament serves as the foundation for our own view.

Since the Beginning is a very academic book. The contributors span the Jewish, Roman Catholic, and Christian faiths, which is the first indication that the book can have no unified theological outlook. The assumptions at play are nearly uniformly theologically liberal. One wishes for the book at *some* point, at any point, to take a stand against evolution, against uniformitarianism, and against the worldly skepticism that dominates mainstream academia. Unfortunately, you can’t always get what you want.

Are all views equally valid?

Since the Beginning introduces us to views across a wide spectrum. As the



editor of the book, Kyle Greenwood, states:

“We will incline our ears to Christian theologians, Greek Sophists, and Jewish rabbis, sometimes in dialogue with each other, and other times with no one in particular. In other words, we will hear the words of prophets, philosophers, and preachers ‘since the beginning’ to the present day” (xx).

From the believing Christian standpoint, however, not all opinions about Genesis are valid. We believe that Genesis is the inspired Word of God that exists to tell us how God created the world, how mankind fell and sin and death were introduced into the world, and what God promised to do to restore creation. Ultimately, Genesis points us to Christ.

Genesis means nothing

The reader of *Since the Beginning* will be interested to know that apparently we’ve rediscovered how the ancient Hebrews viewed the



Figure 1. Flavius Josephus in his *Antiquities of the Jews* interpreted Genesis as history.

world, and it was apparently just like the modern-day liberal! For instance, “the highly stylistic prose of Gen. 1 indicates to the reader/hearer that the interests of its author lie in the theological message of its contents, not in its scientific precision” (p. 4). Therefore the days are not literal days. But wait, the discerning reader may ask, what about Exodus 20 and 31, both of which are “predicated on the six-day creation week” (p. 5)?

“[I]t is likely more accurate to speak of an underlying Sabbath tradition behind Gen. 1 than to suppose that Gen. 1 prescribes Sabbath law. That is, Sabbath observance would have likely already been in place before its codification in the Ten Commandments or Gen. 1” (p. 5).

But note what this presupposes—that it was not written by Moses or even close to contemporaneously with him. The context of Exodus claims to be that the Israelites have been newly freed from Egyptian slavery—not an arrangement that is conducive to a tradition of having a day of rest every week. The gift of the Sabbath is an indication that God is not a taskmaster like the Egyptians, but that He is gracious to His people. If *Since*

the Beginning is correct, it is a false history which is based upon a false cosmology—it means nothing.

Adam

It should surprise no one that this book does not view Adam as the literal first man or the man responsible for unleashing sin and death upon humanity. This is not from the biblical text itself, but from the assumption of evolutionary history.

A biased history

Any summary of positions throughout history will be biased, because even in the act of deciding who and what to include, one must exercise discernment. But *Since the Beginning* routinely includes those who interpret Genesis figuratively, while excluding or discounting those who interpret it plainly. For instance, “Philo comments that to consider that the earth was created in six literal days (i.e. twenty-four-hour periods) would be a sure indication of great simplicity” (p. 30). While immediately acknowledging that Philo’s view was that God created *instantaneously*, the book does not

go into his philosophical reasoning that neither the book nor any modern interpreter would agree with.

Josephus (figure 1) is counted in the ranks of those who do not interpret Genesis literally, given that he “indicates no concern with the length of days”. However, anyone who bothers to read *Antiquities* will note that in 1.29, Josephus says, “and this was indeed the first day, but Moses said it was one day”. Furthermore, he says that Moses begins to speak philosophically “after the seventh day was over” (1.34), indicating that the first six days are *not* speaking philosophically.

One particularly egregious misrepresentation is the quote from Irenaeus, “to believe in God and continue in his love, than by knowledge of this kind to be puffed up and fall away from love” (Irenaeus, *Against Heresies* 2.26). They use this as a support to call for ‘hermeneutical humility’. But in this context, Irenaeus is refuting a type of gnostic numerology and other ‘secret knowledge’. That’s why he speaks of knowledge “of this kind”. Irenaeus views the gnostic philosophy as puffed up knowledge, *not* the biblical account, which he takes plainly (for instance, in 5.23), and has no problem drawing both philosophical and historical conclusions from Genesis. So this would seem to be a rather blatant misrepresentation of Irenaeus.

Biased theology

The book calls Jude 14 a ‘non-descript’ verse in reference to its mention of Adam (p. 61). Yet Jude 14 calls Enoch the seventh from Adam. This is *hugely* significant, because it means that Jude believed that Enoch was literally the seventh generation from Adam, indicating that Jude took Genesis as history.

The book argues:

“... the NT writers do not engage Genesis (or any other OT document) as a way to preserve its

‘original’ meaning, much less to verify the historicity of past people and events, but rather they draw out the implications of the central Christian claim that Jesus Christ is risen Lord” (pp. 73–74).

However, this ignores the fact that all of the NT documents were written for specific purposes, none of which include rewriting the Old Testament, which the NT authors assumed their audiences had access to. Furthermore, those documents have many examples of refuting false traditional views, like Jesus contradicting the Pharisaical traditions and Paul’s polemics against the Judaizers. Yet they never hint at reinterpreting Genesis history.

Interpretation in light of Darwin?

No book on the history of the interpretation of Genesis would be complete without a chapter on the influence of evolution on the interpretation of Genesis. And given the overall liberal tenor of the book, one shouldn’t be surprised that the willingness to reinterpret Scripture based on scientific ideas is taken as a mark of ‘humility’ (p. 243). Yet at least the chapter correctly recognizes that creationists “generally allow for at least some derivation to take place within species (or ‘kinds’ or other preferred boundaries) at least by a sort of Lamarckian trait inheritance over time” (p. 242, note 6). Although it’s not clear why he thinks creationists are Lamarckian, at least they acknowledge that creationists allow for intra-species change.

There is a recognition that:

“... one of the challenges posed by Darwinian biology for biblical interpretation concerns the massive time frames required for chance mutation to render known species. Humans come to exist in a differentiated form only over millions of years of gradual development” (p. 244).



Figure 2. Bultmann’s method of ‘demythologizing’ Scripture is presented as a solution for harmonizing Genesis with evolutionary theory.

Biblical creation is equated with ‘fundamentalism’. Long-age readings of the Bible such as day-age and gap theory as well as progressive creation are viewed more favourably, but it is noted that they are still problematic. The answer, it is argued, is in ‘demythologizing’ Scripture as promoted by Bultmann (figure 2) and following Barth’s ostensibly more ‘incarnational’ theology.

Of course, following Barth’s and Bultmann’s theological methodology allows Genesis to be compatible with evolution or any other following scientific theories—by denying that Genesis speaks about real events that happened in history at all. The six days of creation become nothing; Adam becomes no one, and thus the salvation offered by Christ is solely spiritual and individualistic; and, the *eschaton* is only a personal enlightenment, if even that.

Conclusion

Since the Beginning contains the standard liberal ideas about Genesis,

most of which were not covered for the sake of space. Most readers of the *Journal*, for instance, are familiar with the ways in which liberals try to get around the idea of the six days of creation.

The real usefulness of the book is in its breathtaking honesty about the only way forward regarding a synthesis of the Bible and evolution. It isn’t even a compromising view, because compromise involves give-and-take. This is a unilateral demand that Christians *surrender* completely at every point where evolution contradicts Genesis. What is left is not biblical, and it certainly is not what Jesus and the apostles would have recognized as Christianity.

Does 'race' science refute superior humans?

Superior: The return of race science

Angela Saini

4th Estate, London, 2019

Lucien Tuinstra

British-born journalist Angela Saini (b. 1980) has a Masters in Engineering from Oxford University, where she was a chair of the student union's anti-racism committee, and another Masters in Science and Security from King's College, London. *Superior* is her third book, the title of which cleverly follows that of her book *Inferior* (2018), about the female sex.¹ A review of *Inferior* pointed out: "Her very first chapter exposes Charles Darwin's prejudices and how his views on a woman's place in society tinted, or rather tainted, his theories."²

Superior covers a gamut of well-investigated topics with thorough historical background. These include:

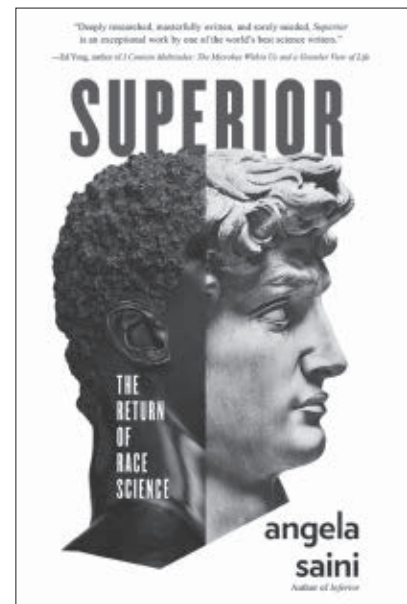
- Deep time: are we one human species, or aren't we?
- Scientific priestcraft: deciding that races could be improved, scientists looked for ways to improve their own
- Race realists: making racism respectable again
- Human biodiversity: how race was rebranded for the twenty-first century
- Roots: what race means now in the light of new scientific research
- Origin stories: why the scientific facts don't always matter

It is beyond the scope of this book review to cover all these subjects. However, one thing made very clear is that the term 'race' and everything associated with it, certainly

from a secular perspective, is rather complex. Culturally, the word 'race' has become engrained into our language, and this exacerbates matters. Angela Saini concludes that it is the culture of a people group that makes them different, but she fails to realise that her evolutionary worldview undermines what she believes.

The evolutionary multiregional (MR) hypothesis has the parallel evolution of separate populations of modern *Homo sapiens* from *H. erectus* in different geographical areas. This view holds that extant human populations worldwide are all the same species, but allows for different people groups to have a history—and thus identity—distinct from other people groups. For some, the MR "has political power ... [because it] feeds fresh speculation about the roots of racial difference" (p. 34). The alternative (evolutionary) view is called 'Out of Africa' (OOA). In this view, a population of modern *Homo sapiens* migrated from sub-Saharan Africa, out-competing and replacing more 'primitive' hominid species (*Homo erectus*, archaic *H. sapiens* and Neandertals).

Having rejected MR, and undoubtedly adhering to an evolutionary history with its accompanying *deep time* (the very title of chapter 1), she is left with OOA. However, this also should stand out to Saini as a worldview with racist roots. On two occasions she references the "Congolese 'pygmy' named Ota Benga" who "was put in the Monkey House at Bronx Zoo" (pp. 60, 80). She is clearly appalled by this horrific account, and rightly so. However, such actions actually make sense in her evolutionary worldview—which would place some beings in the genus *Homo*



closer to ape-like ancestors than to other human beings. Seemingly though, no conundrum exists in *her* mind.

What motivates racist beliefs?

This can be easily answered. It is either driven by pursuit of illegitimate (political) power, love of money or a desire to feel superior to others—or a combination of the above, which are often linked. Saini writes about these things. "The key to understanding the meaning of race is understanding power. [It] has shaped the idea of race and continues to shape it" (p. 3). Professor of Evolutionary Genetics at University College London, Mark Thomas, is quoted as saying: "it's not that [ancestry testing firms have] got particularly racist agendas. They want to make money, and you make money by servicing people's prejudice" (p. 162). Elsewhere she asks: "isn't this exactly what racism is? A dislike of others in the belief that they are biologically different?" (p.156).

Nowhere in the book does the notion of sin come up, which clearly underpins these three factors (power, avarice, and desire for superiority). The crux of the matter is that

evolutionary thinking must seek an underlying material explanation for these factors. Although Saini might not like this idea—or even agree with it—she essentially has no choice, since she adheres to the molecules-to-man worldview (she has also written for the atheistic magazine *The New Humanist*). In that framework, any desire for racial superiority, for instance, must ultimately be explained by one’s evolutionary heritage. Naturalism has no good explanation for morality, on the grounds that matter is all there is.

Fruits of racism

However, the outworking of these beliefs takes different forms at different stages of history and in different geographic locations. Being of Indian origin, Saini discusses first-hand the caste system still prevalent in her family’s home country. Due to India’s sheer size, and being very populous, the country covers a plethora of skin ‘colours’; somewhat surprisingly she includes “paper white” (p. 213) in this. A prospective employer even suggested “wheatish” (p. 217) as a skin colour. But it is not just appearance that determines grouping. Not unlike the tradition in Western countries, it is still quite normal—perhaps expected—for children to follow in their parents’ footsteps. So the up-and-coming generation will have the same jobs, live out their lives with the same cultural outlook, and—not surprisingly, with little ‘inter-racial’ marriage—look similar, since they are family after all.

Saini does caution against the erroneous “conclusion that the human zoo is like an animal zoo, each of us defined deep down by our stripes and spots” (p. 220), a saying reminiscent of Jacob tending Laban’s sheep (Genesis 30:32ff.). It is understandable that certain physiques lend themselves better for specific jobs, but not so much for others. That does not mean

that a person’s career is therefore predetermined. Cognitive levels, as well as natural talents and learned skills, can vary greatly, even among members of the same family. Besides, even if the genes for being tall are present, a malnourished person will not grow to his or her full potential.

Within the Indian caste system, it is extremely difficult for someone born and raised in a lower caste to escape it. In other words: born in a caste, always part of that caste. This is unsurprising since it wasn’t the poor and oppressed that devised a class-based society; rather, it was the affluent that wanted to protect their belongings and look down upon the less ‘fortunate’. Yet, this millennia-old caste system comes as second nature to most of India’s inhabitants—few even think to question it. Even on a smaller scale, people of the same caste generally associate with their local community. So much so, that geneticist Sridhar Sivasubu even admitted that, “despite fully understanding the genetic problems, his culture was so important to him that he found a wife from within his own group” (p. 239). It seems generally true that human beings are drawn to people who are more physically alike (including similar shade of skin), therefore it makes sense to look for friends and spouses in the community you were raised in. Perhaps the advent of air travel and, more recently, the Internet are taking down some barriers in this respect.

Bespoke medicine

You’ll be forgiven if you have never heard of the ‘slavery hypertension hypothesis’ before. This ‘survival of the fittest’ story is as follows: slaves imported from Africa that actually survived the journey across the Atlantic Ocean (“Middle Passage”) have a higher salt-retention than those that died “along the way as a result of fluid depletion caused by

dehydration, vomiting and diarrhoea” (p. 243). Hypertension means blood pressure is too high, often due to high salt concentrations in the blood. Those that could not withstand this higher salt level were the weaker ones that did not survive the journey. Dr Clarence Grim, founder of the hypothesis, concluded that the Western diet was the culprit. How so? Well, research has shown that “rural Africans, have the lowest levels of hypertension in the world” (p. 248). Their local diets don’t include much salt. Case closed?

Some biologists were not so sure. They questioned whether natural selection could have such an effect in essentially just one generation. Just because a correlation is apparent, it might not be the root cause. Eating too much salt is bad for any human being, irrespective of the shade of your skin. Fortunately, there are medicines to choose from in treating hypertension. To release a new drug, it has to be approved first, which requires thorough



Figure 1. Ota Benga and Polly the chimpanzee, brought from the Congo to be displayed at the Bronx Zoo.

testing. This takes time and costs a lot of money.

Saini relates how a pharmaceutical company decided to test their new anti-hypertension medicine on a small group of ‘black’ people only—which preliminary testing had shown able to extend life expectancies. A small sample size because it would save time and money, but why choose those who were ethnically ‘black’? Because the traditional drug (of a different type) for this people group was statistically less successful than it was for ‘white’ people. The drug was tested only on 49 ‘black’ people, so it was marketed as such, “the world’s first black pill” (p. 255). Interestingly, “the Association of Black Cardiologists welcomed it as a positive move, finally recognising the historically neglected medical needs of black Americans” (p. 255)! Others recognised it for what it was—a way to make money from something that was on borrowed time, due to its patent ending soon.

If that sounds surprising (i.e. because it appears politically incorrect), how about the idea that cystic fibrosis is a ‘white’ disease? One ‘black’ girl repeatedly failed to be diagnosed for cystic fibrosis, until a passing radiologist recognised it on her X-ray, not knowing who it belonged to. Bias makes blind! The following statement by an epidemiologist and statistician at McGill University in Canada, Jay Kaufman, nicely sums up the ironies of this situation (p. 267): “We’ve had a decade of genome-wide association studies now, we’ve spent billions and billions of dollars, and we still are at the position that it looks like ninety-seven per cent of the mortality disparity between blacks and whites in the United States has nothing to do with genes.”

Concluding remarks

In the last chapter of *Superior* Saini reports on a survey of medical researchers in Californian laboratories.

For these people, “[r]ace was their bread and butter, the entire premise upon which they were doing their research, but they were unable to tell her what it was” (p. 288). Following the money often explains people’s behaviours. However, there is a more sinister aspect to the subject of this book: superiority. Unfortunately, Angela Saini misses the root cause: sin. If people can just compare themselves to others and come out superior, they feel better about themselves. Rather than putting others down or raising ourselves up, we should realise we are all one blood (Acts 17:26), but none of us is righteous (Romans 3:10).

Saini occasionally slurs the conservative right for being racist (pp. 137, 139, 145, 149). The following people (past and present) did not escape comment:

- Carl Linnaeus apparently “included two separate sub-categories within his *Systema Naturae* for monster-like and feral humans” (p. 47).
- Thomas Jefferson and Abraham Lincoln “believed that blacks were inherently inferior to whites” (p. 54).
- Gregor Mendel: In a cursory remark it is implied that the idea of eugenics has its origin in the work of this Augustinian friar, “that everything is inherited, that it’s in the genes” (p. 71).
- Ronald Reagan apparently praised Roger Pearson, a racist Darwinist, “for promoting scholars who supported ‘a free enterprise economy, a firm and consistent foreign policy and a strong national defense’” (p. 114).

Racial prejudice is nothing new, as the late Stephen Jay Gould famously pointed out:

“Biological arguments for racism may have been common before 1850, but they increased by orders of magnitude following the acceptance of evolutionary theory. The litany is familiar: cold, dispassionate, objective, modern science shows us

that races can be ranked on a *scale of superiority* [emphasis added].”⁴

Evolution made things worse. It does not provide a solution, rather it only exacerbates the inherent racial prejudice in the sinful heart of man. Saini admits:

“... those committed to the biological reality of race won’t back down if the data proves them wrong. ... They will simply keep reaching for fresher, more elaborate theories when the old ones fail. All this to prove what they have always really wanted to know: that they are superior” (p. 292).

Fortunately, God has provided the Way for individuals from every nation, from all tribes and peoples and languages, to come before the throne of God (Revelation 7:9).

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Salt deposits

The origin of salt deposits is a tough question that Flood geologists need to consider. Stef J. Heerema and Gert-Jan H.A. van Heugten, in “Salt magma and sediments interfingering”¹ posited an original and interesting thesis. Unfortunately, though, I think they fell far short of dealing with many issues realistically.

They did a good job refuting slow evaporation forming kilometres-deep evaporite beds. They also provided a good refutation of centimetres of horizontal expansion for halite being extrapolated into rising columns, and tens of cubic kilometres of migration into diapirs and canopies.

They recognized solid halite does not have buoyancy working for it, and liquid does, so they proposed salt magma being emplaced and moving into the diapirs—raising walls, pillars, and domes—as a liquid. But, their use of Ol Doinyo Lengai volcano in Tanzania as a possible modern analogy is poorly chosen. Moreover, modelling their salt magma interfingering with water-deposited sediment has problems regarding the salts dissolving.

Ol Doinyo Lengai produces a natrocarbonate (ultra-alkaline) lava. Although this confirms that carbonate rock can be directly derived from this alkaline lava, it is not unique. Niu² found alkaline lava inland on all the world cratons and even oceanic islands. So, magma like this is more common than Heerema and van Heugten seem to think; it is available where needed to form carbonate sediments, but it does not contribute to the formation of halite.

Closer inspection of Ol Doinyo Lengai eruption shows it to be a black water-like fluid which turns white as it crystallizes and combines with water (figure 1). This is the exact opposite of salt. Thus, it is composed not of water or salt, but predominately ~580°C (1,076°F) carbonate minerals (molten limestone). Yes, this black

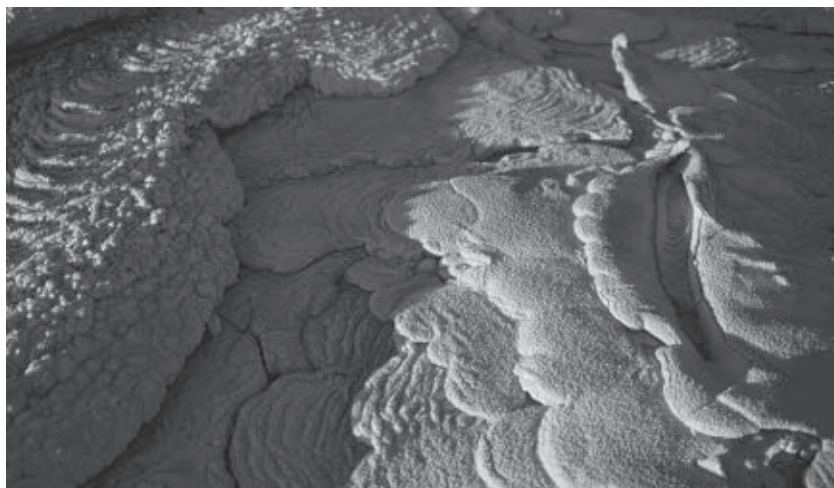


Figure 1. Lava flows from Ol Doinyo Lengai, Tanzania. It cools to a silvery-grey colour, but is still a carbonate mixture, not a salt pan.

watery magma does contain all of the elements found in association with the salts, as do all the alkaline magmas of the world. Africano *et al.*^{3–5} used fume samples from multiple volcanos and showed by differential crystallization that Na and K were the most prominent cations, followed distantly by Fe.⁶ But, the key is ‘cooled’; they refer to a differential crystallization cooling process to separate different types of mineral sediments.

The lava of Ol Doinyo Lengai gets to the surface at a relatively low temperature, but it is the great proportion of molten carbonate which lowers the eutectic point to ~580°C from the ~800°C (1,472°F) which liquid halite would require to be molten.⁷ The trouble with even a eutectic

Figure 2. Stratigraphic column for the lowest portion of the Gulf of Mexico (after Douglas¹¹)

Period	Epoch	Rock Unit
JURASSIC	Lower Cretaceous	
		Cotton Valley Group
	Upper	Haynesville Formation
		Buckner Anhydrite Member
		Smackover Formation
		Norphlet Formation
		Pine Hill Anhydrite Member
		Louann Salt
		Werner Anhydrite Formation
	Middle	
	Upper Triassic	Eagle Mills Formation
Crystalline Basement		

temperature as low as ~780°C (1,436°F) as Dr Oonk suggests⁸ is that it would require crystallization with an intimate mixing of the halite (NaCl), sylvite (KCl), and carbonate

Image: Thomas Kraft, Kufstein/CC BY-SA 2.0 DE

(CaCO₃) crystals. Intimate mixing of cryptocrystalline forms does occur in some locations of the massive evaporite beds, but most of the deposits are mono-mineral and would require large separated pools of molten halite, sylvite, or carbonate requiring temperatures of ~780–800°C to crystallize separately. The key to salt production is not liquid vs solid, but higher temperatures vs lower temperatures.

They suggest molten halite could ‘skin-over’ which would protect it from dissolving in the sediment’s transporting water. This would just form hot salty steam. Maybe molten halite would solidify faster than it could dissolve, but it would only be a delayed response; NaCl has no protective temperature from solubility.

The only way to get salt interfingering into depositing sediments is to produce the salt and keep it from the floodwaters until it is buried by hydrophobic sediments. The easiest way to get the hydrophobic sediments within the Flood is to produce *hot*, 450–800°C (840–1,470°F) sediments.⁹

Heerema and van Haugten want to attribute anhydrite origin as magma on the authority of Luhr’s paper, “Primary Igneous Anhydrite”.¹⁰ Luhr shows anhydrite deposition always associates with high temperature, and is found in magma. Today anhydrite is being deposited in hydrothermal vents as long as they stay hot. But, the occurrence as phenocryst in lava is a long way from bedded anhydrite, like the Werner, Pine Hill, and Buckner anhydrite beds around the Louann Salts in the Gulf of Mexico (figure 2). What Luhr does say is that these beds had to have a hot origin, around 800°C (1,470°F). But, a high temperature origin does not necessarily translate into lava. Additionally, the anhydrite had to be protected from *cold* seawater during its deposition, because anhydrites are more soluble in cold water than hot, which eliminates the

possibility of sediments depositing in cold waters around this salt magma. (Crystals of anhydrite do not last a year in specimens exposed to surface weathering.)

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» Stef Heerema and Gert-Jan van Heugten reply

We appreciate the letter to the editor concerning our paper “Salt magma and sediments interfingering”.¹ Thanks for qualifying our thesis as original, interesting and ‘a good refutation’ of the evaporation model and the formation of salt diapirs from solid rock salt deposits. That covers about

95% of our paper. We want to take this opportunity to further support the other 5%.

Ol Doinyo Lengai

We stated that “[there] is no modern analogue where a large salt formation is being formed” (p. 119). That includes the active salt volcano Ol Doinyo Lengai (ODL). First, the amount of lava it produces is negligible compared to the millions of cubic kilometres of rock salt. Second, ionic liquids like salt magma can dissolve rock, if there is enough time. During the Flood, a vast quantity of salt magma was produced (and solidified) in a short time according to our model, whereas the comparatively small volume of ionic liquid ODL produces rises slowly through the crust, continuously. Therefore, the salt magma of this volcano becomes contaminated, which is unlike the salt deposits that were formed during the Flood. So it is not a modern analogue. Though we addressed the observation that this salt volcano, together with several salt formations, is situated in the Great Rift area. All chemical elements within salt formations are present in the magma of ODL. ODL is an example of a volcano with a relatively low temperature and high fluidity of its magma (the magma is so thin that it fountains out of small openings like a lawn sprinkler). This corresponds to what we expect from the salt magma that solidified during the Flood. Despite the melting point of pure halite at 1,077 K,² a mixture containing also other chemicals is likely to have a lower melting point. The more different chemicals that dissolve in the mixture, the lower the melting point becomes. The ODL shows how CaCO₃ with a melting point of 1,073 K,² can still be in liquid phase at 783 K.

The uniqueness of ODL lies in the fact that it is the only active salt

volcano, producing carbonatites. We are well aware that this rare kind of lava is present at more locations. For future research, we would advise to focus on carbonatites instead of the much wider group of alkali-metal-rich lavas. Alkali-metal-rich lavas, brought forward by the author of the letter, are mostly formed within oceanic lithosphere, whereas carbonatites are almost exclusively associated with continental rift-related tectonic settings. That is the relevant association that has to be addressed, as this is where many salt formations are situated. As an example, we listed the sub Zechstein rifts (p. 122). However, to research them is beyond the scope of our paper, which focused on salt tectonics.

Unlike the author of the letter claims, the limestone in carbonatite is a salt as well. Concerning the carbonatite of the ODL it is widely accepted that it is from a primary igneous origin.³ As limestone is commonly present in salt formations, it again shows an analogue between the salt formations and this rare salt volcano.

Solidification of salt magma

The writer of the letter claims that a eutectic melt of halite, sylvite, and carbonatite will solidify in mix crystals mostly. However, any reference to underpin this claim is missing. First it overlooks that the melt contains more salts (anhydrite, magnesium chloride, etc.). Second, at this stage of research it is simply unknown if all salts are even miscible in molten state. They might as well flow in separate layers of different composition and density. In which case each layer will solidify at other temperatures and pressures, following different eutectic logic. Third, the author of the letter overlooks that it is quite common to form mono-mineral layers from an eutectic system. Fourth, salt formations solidified ‘on the move’. The resulting crystallization

will differ largely from regular test set-ups. The solidification process of salt will therefore require extensive study and is beyond the scope of our paper as we stated (p. 122).

Molten salt will not dissolve in water

To see the reaction between molten NaCl and water it might be interesting to check out the experiment of the ‘BackyardScientist’.⁴ A small amount of molten salt poured into his aquarium caused it to explode. The test shows that water will immediately transform from liquid into steam the moment it comes in touch with molten NaCl. NaCl is barely soluble in steam.⁵ When a solidified halite skin formed between the molten core of the salt magma and the unconsolidated watery sediments of the Flood, the water was expelled and the mud dried, which prevented the outer halite skin from dissolving. Although this newly formed sedimentary rock had some permeability, it prevented any fast water flow in which the salt could have been dissolved.

Anhydrite

As the title of Luhr’s paper clearly states, the primary igneous origin of anhydrite is a serious option that needs to be considered.⁶ The example given by the letter writer of anhydrite deposited out of a hydrothermal vent into *cold* seawater just underlines that anhydrite can crystallize out of a salt magma amidst Flood sediments.

Recommendations

We trust to have answered the concerns of the author of the letter. More clarification can be found in the lecture as presented at the European Creation Conference in London in 2018.⁷

We hope to continue our research in the future. Any and all able and willing to contribute are most welcome to contact us.

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Comparison of morphology-based and genomics-based baraminology methods

Matthew Cserhati and Joel Tay

New genomics-based statistical approaches have helped us in baraminology research. There is currently much genomic data available in the public databases suitable for baraminology studies. This paper discusses the strengths and weaknesses of both morphology-based and genomics-based methods. It is hoped that the use of both types of methods will complement one another in future baraminology research. With more than one line of evidence, baramin membership can be determined with more confidence. This also allows us to classify a greater number of species, since if one type of data (i.e. morphological) is unavailable, another data type (such as genomic data) may still be available for analysis.

Baraminology is the study of created kinds, as presented in the book of Genesis. Genesis 1, verses 11, 12, 21, 24, and 25 describe how organisms, plants, and animals were created to multiply according to their kind. Baraminology aims to group species into created kinds, which were each created separately from one another during Creation Week. Created kinds are also known as baramins, which comes from the Hebrew words for ‘create’ and ‘kind’. Species within one kind may be capable of breeding with one another, but between created kinds no interbreeding is possible. A holobaramin is equal to the complete species membership of a created kind.

Methodological baraminology has been in existence for several decades, but it has recently come to a new point of development. Before now, the morphology-based baraminic distance (BDIST) method has been widely used and it has been generally successful in the prediction of holobaramins.^{1,2} Recently a new genomics-based algorithm has been developed to predict holobaramins, which may be used to complement the existing morphology-based algorithm.^{3,4} Thus, multiple lines of evidence can now be used in helping to determine baramin membership. In this paper, we assess the strengths and weaknesses of these two methods in defining baramin membership. Using either one or the other, according to data availability, also helps increase the number of species which can be subjected to baraminology studies. Table 1 shows a summary of advantages and disadvantages of both kinds of algorithms.

Morphology-based methodology: BDIST

The BDIST method has been used widely in the creation science community in the last 15 years. BDIST is a quantitative method of comparing both living and fossil specimens based on phenetics (i.e. observable traits). The software calculates the pairwise correlation and baraminic distance of the species under examination based on the

character data set used as input and outputs these values into a matrix. It then maps out a statistical graph of how these creatures relate to one another on a baraminic distance correlation matrix. Optimally, species within a given baramin are highly similar (higher correlation, lower distance) to one another and dissimilar to species from another baramin (lower correlation, higher distance). Three-dimensional coordinates can also help depict species relationships in three dimensions.

The method has generally been useful, but it has received its fair share of criticisms.⁵ In the creation science community, we are aware of the differences between those who would lump species together into a single holobaramin, thereby reducing the number of holobaramins at Creation Week, versus those who split up holobaramins, thereby increasing their number.⁶

BDIST tends to lump species into a smaller number of baramins than there seem to actually be. This was seen in a study of cephalopods where the BDIST method predicted only three baramins out of 104 species, whereas mitochondrial genome alignments predicted up to seven.⁷ A recent analysis of dinosaur species using BDIST brought down the number of predicted dinosaur kinds from 50 to just eight.⁵ Furthermore, the BDIST method incorrectly classified both *Homo habilis* and *Australopithecus sediba* as members of the human holobaramin,⁸ despite the fact that these two species are merely commixtures of human and apelike extinct primate bones.⁹ The method also misclassifies small-sized humans into a different holobaramin to the human holobaramin.¹⁰ Therefore, a caveat should be added to the method. It should be used exclusively on only healthy, adult members of a given species. Juveniles and deformed individuals and skeletal remains that represent assemblages of individuals should be avoided.

One of the strengths of multivariate analytical approaches such as BDIST is that it allows us to compare and quantify hundreds of phenetic measurements. But statistical output

depends heavily on the input data. For example, in a recent paper using a multivariate approach, Doran *et al.*, concluded that “some Jurassic and Cretaceous avians grouped with dinosaurs”, grouping *Archaeopteryx* and *Wellnhoferia* within *Deinonychosauria*.¹¹ In their ‘Feathered dinosaurs reconsidered’ article, McLain *et al.*¹² likewise used a multivariate analysis method and concluded that there are “multiple holobaramins of feathered dinosaurs” and that the “old dichotomy of bird versus dinosaur is unhelpful and incorrect”. They go on to say: “Birds could rightly be viewed as a specialized type of dinosaur without implying birds evolved from dinosaurs.”¹² The first part of the McLain *et al.* paper surveyed the literature on feathered dinosaurs and concluded that many dinosaurs did indeed have feathers. The second part involved an extended multivariate analysis. The conclusion was that “many species of dinosaurs were indisputably feathered. The available fossils have moved us permanently beyond questioning whether some dinosaurs were feathered and onward to interpreting the implications of feathered dinosaurs.”¹²

While space does not allow for a more comprehensive rebuttal of every example listed in McLain *et al.*’s 42-page paper, we are convinced that most of the examples listed in the first half of their paper as ‘feathered dinosaurs’ are either examples where dermal collagen was misidentified as true feathers or examples of true feathered birds that have been misclassified as dinosaurs.^{13,14} Most of the examples presented as true ‘feathered dinosaurs’ have already been adequately refuted in the scientific literature.^{15–17} The error of conflating dermal collagen with that of true feathers is especially significant, since the second half of the paper involved a multivariate analysis related to the first part of their paper. Since the first part of the paper mistakenly conflates bird feathers with dinosaur dermal collagen, it is not surprising that the second half ends up conflating birds as a type of dinosaur. Wrong data in, wrong data out.

As stated earlier, one of the limitations of BDIST is that it tends to lump too many unrelated species into a single holobaramin. Part of the reason why this is the case has to do with the method itself. In the article ‘How to think (not what to think)’, Carter illustrates a helpful paradigm for interpreting evidence.¹⁸ Using a Venn diagram with two overlapping circles (see figure 1 in Carter¹⁸), he illustrates how evidence often falls in what he calls Zone II. This area contains evidence that is consistent with two contrary views. Evidence that falls in Zone II cannot be used as evidence for or against two contrary positions.

How does this paradigm apply to our use of BDIST and other multivariate methods? BDIST indiscriminately evaluates a wide range of phenetic measurements. In this sense, BDIST is, methodologically speaking, a form of ‘hyper-phenetics’. Applied to the study of baraminology, Zone I and Zone III represent diagnostic traits that are unique to two different creatures (i.e. autapomorphy), and Zone

Table 1. Comparison of advantages and disadvantages of morphology-based and genomics-based baraminology methods

Morphology-based methods (BDIST)	Genomics-based methods
Advantages	
Solid, descriptive statistical framework	Not sensitive to convergent morphology
Intuitive concept	Widely available data
Descriptive visualization	Intuitive concept
	Descriptive visualization
	Can be used to study micro-organisms
Disadvantages	
Sometimes data is incomplete (i.e. only craniodental characters, missing values)	Missing proteins, low-coverage genome
May lump species	Sensitive to species selection
Convergent morphology may confound algorithm	Sensitive to what counts as a protein sequence
Sensitive to both small and large number of species	Mitochondrial data not representative of whole genome
Must analyze all of one age group (i.e. adults/juveniles)	
Used primarily in multicellular organisms	

II refers to traits that are shared by both creatures but are not unique to either one. Traits that are unique to specific holobaramins are necessarily going to be rarer than traits that are non-diagnostic and shared between organisms. In other words, if we compare a whole series of traits between two organisms without regard to whether those traits are unique, we are likely to end up with a situation where two different organisms are grouped close together on a continuum. The more shared characteristics we include in the analysis, the closer the two creatures will cluster as one. In this sense, the more shared traits (from Zone II) we include in the analysis, the less accurate the analysis becomes—resulting in the tendency to over-lump different organisms into one single holobaramin. But if current BDIST approaches almost always include Zone II characteristics in their analysis, how reliable are they? As we have already mentioned, when compared with the more precise method of genomic-based algorithms, BDIST has consistently failed because it has a tendency to over-cluster different holobaramins as one.

Let us take for example the question of how dinosaurs and birds relate to one another. If in the Venn diagram in

Overlapping Predictive Realms

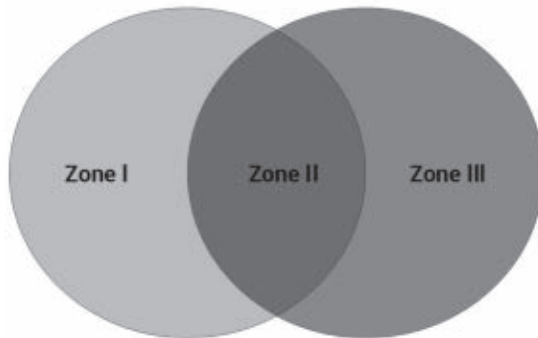


Figure 1. Unique diagnostic traits for two creatures that are grouped under Zone I and Zone III respectively, while traits shared between two different organisms are classified under Zone II.

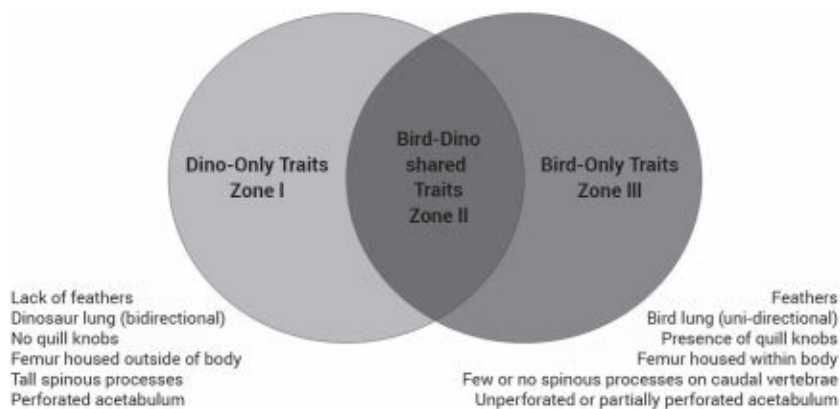


Figure 2. Using birds and dinosaurs as an example, unique diagnostic traits for dinosaurs are grouped under Zone I, while unique diagnostic traits for birds are grouped under Zone III. All traits shared between both creatures are grouped under Zone II and are excluded from BDIST analysis.

figure 1, we place dinosaurs in the left circle, and birds in the right circle, Zone I would represent traits that are unique to dinosaurs, while Zone III would represent traits unique to birds. Zone II would represent non-unique traits that are shared by both organisms.

If we compare birds and dinosaurs, as the number of shared traits is increased, birds and dinosaurs cluster closer and closer together. This problem can be avoided if we deliberately exclude Zone II characteristics from our analysis, and only compare Zone I and Zone III characteristics. So, for example (in figure 2), we list several unique characteristics of either dinosaurs and birds (Zone I and Zone III).¹⁷

By limiting BDIST to only unique Zone I and Zone III characteristics, we can avoid artificially conflating two potentially different holobaramins as one. And if in the scenario above, birds are indeed dinosaurs, excluding Zone II characteristics would actually allow us to identify this even more readily than if we include zone II characteristics in our analysis. For example, if birds are indeed dinosaurs, we should be able to find consistent examples where a creature exhibits a mixture of both dinosaur-only and bird-only traits.

So, we should be able to find examples of a bird that has flight feathers (Zone III) as well as a completely perforated acetabulum (Zone I). The completely perforated acetabulum is a diagnostic trait unique to dinosaurs, and flight feathers are, as far as we can tell, unique to birds. While some have argued otherwise, the evidence does not support the conclusion that there are dinosaurs with pennaceous feathers. Future analysis of BDIST can be improved by deliberately identifying Zone II characteristics and by excluding these characteristics from our study. In other words, the exclusion of Zone II characteristics actually allows us to both identify instances where traditional BDIST has over-clustered creatures together and identify instances where we have artificially separated one holobaramin into two different clusters.

For example, a new character matrix filtering method based on filtering out low-entropy characters filtered out Zone II characters from the data matrices used in the baraminology analysis of cephalopods⁷ using data from studies by Lindgren *et al.*¹⁹ and Sutton *et al.*²⁰. A low-entropy value for characters means that character values for all species in the data set are very

much uniform. After re-running the BDIST method on the filtered data set, and selecting highly correlated species pairs with a 95% bootstrap value, the Decapod group was split up into three groups: Oegopsina, Myopsina, and Sepiida+Sepiolida+Spirulida (see figure 3).

The precision of BDIST also suffers if there are only a few species available for comparison, or if only an incomplete data set is available.²¹ For example, the method has been used on many data sets for which we only have craniodental characters, but this does not provide a holistic view of the baraminic relationships between species based on their entire morphology.

In a first analysis of hominin craniodental characters, Wood concluded that *A. sediba* was part of the human holobaramin.⁸ His position changed somewhat after using the BDIST method to analyze not just craniodental characters, but also post-cranial characters,²² as well as hand characters.²³ Wood found that with added post-cranial characters (present for six species), significant discontinuity was only demonstrated between *Australopithecus afarensis* and *Homo sapiens/erectus*.²⁴ Whereas *A. sediba* did not show

any significant continuity with the human holobaramin any more, it did not show discontinuity with this holobaramin. These are exactly the results which one would expect, since *A. sediba* has been classified as a basket taxon,⁹ containing characters of both human and apelike extinct primates, causing it to cluster away from both holobaramins.

As Wood correctly noted, “samples of very few taxa are not likely to exhibit significant correlation even if clusters are present”.²⁴ Wood had to reduce the number of species in his analysis which included post-cranial data. He claimed that due to post-cranial characters being available for only a few hominins, “This tradeoff between character sample size and taxon sample size may inhibit rather than enhance the detection of taxon clusters.” The ideal case would be if we had craniodental and post-cranial characters for all desired species. We may have to accept the limit that such characters may never be available, unless found in fossils by further paleontological excavations. Here data quality and availability are key issues to be balanced.

Furthermore, the BDIST method also has the potential of misclassifying many species into the same baramin, just because they resemble each other phenotypically. In contrast with the more accurate approach of using genomics-based algorithms, BDIST does not account for homoplasy. By eliminating zone II traits, we are at the same time also eliminating homoplastic traits, allowing the method to be more accurate. However, in an analysis of cephalopod species by O’Micks, the method does correctly

classify *Argonauta nodosa* as an octopod rather than a species of the nautiloid kind.⁷

Baraminology researchers using this method should be wary of the underlying assumptions that evolutionists have when assembling their data sets (i.e. when *H. habilis* and *A. sediba* were misclassified as real taxa). To bring us back to the illustration used earlier: if creationists would have excluded Zone II traits from the analysis and only performed a BDIST on unique traits of humans and australopithecines, (since *H. habilis* contained both unique traits of humans and australopithecines) it would have been apparent to the creationist researcher that he is dealing with a basket taxon, since the Bible makes it plain that humans belong to their own separate holobaramin, which is separate from all animal species. This means that humans were created separately from the apes. Thus, a mix of Zone I and Zone III traits in *H. habilis* would be indicative that it is a basket taxon and not a real individual. Furthermore, when selecting characteristics for analysis, only non-fragmentary and non-ambiguous characters should be considered. In other words, those characters should only be chosen based on clear diagnostic traits that are unique to a holobaramin.

Genomics-based algorithms

The genomics revolution has caused quite a bit of controversy, invalidating and qualifying multiple older morphometric studies. Yet, genomics-based algorithms

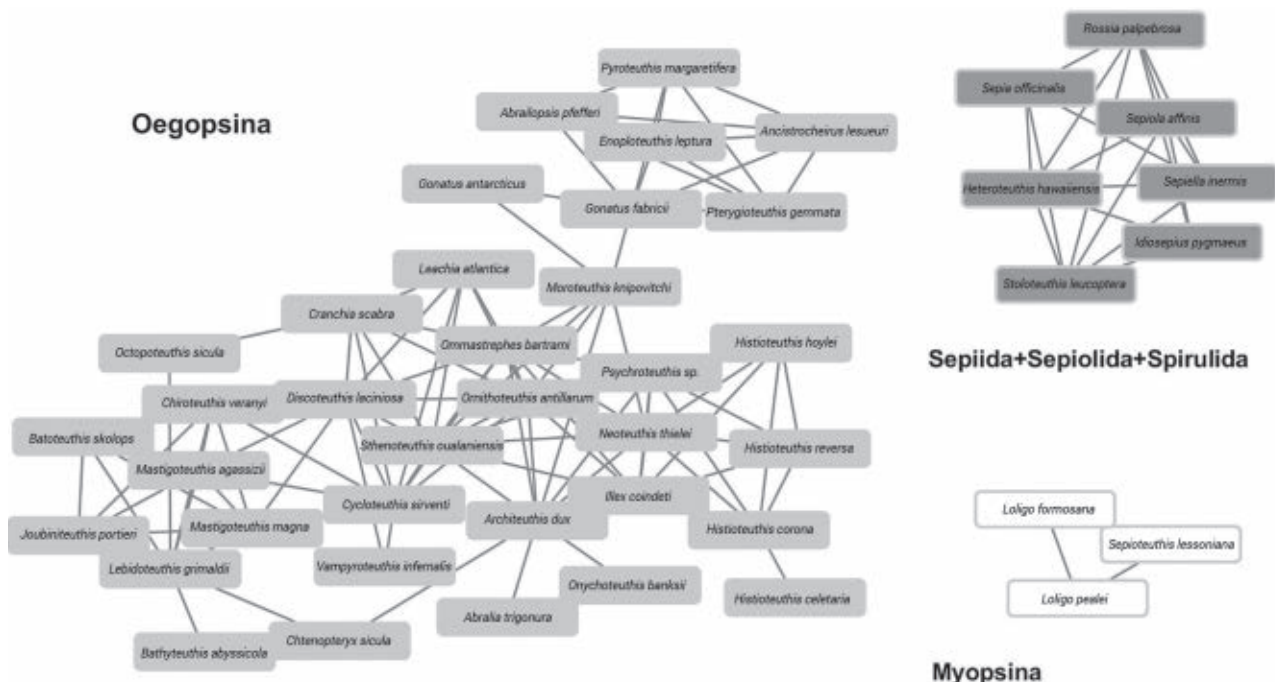


Figure 3. Depiction of baraminic relationships between different decapod species after entropy filtering of the Lindgren *et al.*¹⁹ and Sutton *et al.*²⁰ data sets. After the original data sets were filtered to increase character entropy, BDIST was re-run on the resultant character matrix. Those species are linked together which have at least a 95% bootstrap value in at least one of the BDIST results.

should always be given preference over morphology-based algorithms, for several reasons. First, the genotype determines the phenotype, meaning that genetic factors are ultimately responsible for determining the morphology of a given species. Second, morphologically similar organisms may be genetically different, and vice-versa—genetically similar organisms may be different morphologically. For example, the kingsnake and the coral snake look very similar externally, but are quite dissimilar internally. As a further illustration, if morphology-based techniques *alone* would have been used in the analysis of cephalopods, the octopod species *Argonauta nodosa* could have been classified as a nautiloid on (rough) morphological grounds, yet genetically it is an octopod (and was correctly classified as such by genetics-based algorithms).⁷ Third, with the break-up of the archebaranome (that is, the genome of the archebaramin which was created during Creation Week), new species arise via vertical descent. In other words, the genomes of all species within a created kind can be derived from the original archebaranome. Because these methods study the genome, any kind of organism may be studied, irrespective of its morphology. Even individuals with hardly any morphological remains can be included (e.g. Denisovans).

Early on, a number of mitochondrial studies were used to aid in morphology-based baraminology studies, for example to help determine the number of turtle baramins²⁵ or to measure the diversity of the cat, dog, and horse baramins.²⁶ Mitochondrial comparison is useful because gene order is the same across a great number of species, and gene paralogy and diploidy do not complicate the picture, as in the case of the nuclear genome. Furthermore, it is much easier to sequence the mitochondrial genome, and it is usually available for species for which the nuclear genome is not yet available.

Genomics-based methods, such as the Gene Content Method (GCM) could potentially harness the vast quantities of genomic data in public databases, such as NCBI, the UCSC Genome Browser, UniProt, and others. For example, bacterial genomes can be sequenced in a matter of hours, based on the latest technologies. Whole genome sequences have been created for an estimated 50 bacterial and 11 archaeal *phyla*, amounting to more than 14,000 total species by 2014.²⁷ Since it deals with gene content, not the specific nucleotide sequence, GCM depends on the availability of annotated genomic data. Even if the whole proteome of a species is unknown, dozens of gene/protein prediction algorithms exist, such as Augustus, GeneMark, and others which can predict protein sequences for them. Furthermore, databases such as the Pathosystems Resource Integration Center (PATRIC) already contain data for orthologous gene content in dozens of bacterial species.²⁸ In addition, databases such as MetaRef contain data on the core- and pan-genomes of numerous bacterial species.²⁹

It would also be highly interesting to analyze the genome of archebaramins. The whole genome sequences of

Neanderthal and Denisovan have already been determined.³⁰ Such analyses could shed light on intrabaraminic relationships and could possibly resolve certain issues regarding the baraminic status of certain species, such as the recently discovered *Homo naledi*, which is held in creationist circles to be either an ape, human, or a mixture of the two.^{9,31,32} Fossils may be interpreted in many different ways, but genome sequences are less subjective and more easily quantifiable.

Despite the seeming utility of genomics-based algorithms, they do suffer from some drawbacks. First, the mitochondrial genome represents only 0.01% of the entire human genome. Thus, certain conclusions about the entire human genome in general cannot be made by analyzing the mtDNA alone. Second, genomics-based methods are sensitive to the type of data used, whether it be an incomplete proteome or a genome sequence with low-coverage (i.e. lower-quality) data. A related problem is where to draw the boundary of protein sequence homology, which is necessary to determine protein homologues between two species, which is used as input for the Gene Content Similarity Method, a recently developed genomics-based baraminology method.⁴ The twilight zone is a protein sequence similarity limit above which common functionality can be inferred between two protein sequences. This is because sequence determines structure, which in turn determines function.³³ Finally, whether or not non-genic elements such as pseudogenes or non-coding RNAs should be used is still an open question. These methods are also sensitive as to the number of species, and what kinds of species are selected for study. For example, if species are selected from a wide range of taxonomic categories (such as species from different phyla), the algorithm will discover clusters of species, no matter what. Therefore, it is advisable to select many species for study which appear to be within the same lower taxonomic category (family or order).

Summary and outlook

In conclusion, morphology-based methods may have their drawbacks, so it may be time to rethink and redevelop such algorithms. However, they are still useful. Overall, the BDIST method uses an intuitive concept and a descriptive mode of visualization, as does the genomics-based GCM method. BDIST is complementary to genomics-based algorithms, and while it is useful under the right circumstances, it should only be relied upon if genomic data is not available. Moving forward, special care must be given to separating possible ambiguous (Zone II) and diagnostic (Zone I and III) characters from one another in future baraminology studies. This should be done as a part of our creationist presuppositions in order to avoid over-lumping species into smaller numbers of clusters with large species membership as opposed to many clusters with small membership.

With the gigantic amount of genomic data that is currently available, genomics-based baraminology methods seem to be a useful tool, which can be put to much use. Much of the available genomic data has yet to be tapped for use in baraminology. As an idea for future genomics-based baraminology methods, it would also be useful to measure the correlation between the k-mer/motif content, instead of the protein content, of the genomes of different species to measure similarity. Such a method is currently being developed.

In sum, current baraminology algorithms and methods of any kind are finite and imperfect, reminding us that God's perfect truth never changes. We must strive to improve our methods so as to be able to "think God's thoughts after Him" (Johannes Kepler, 1571–1630).

Materials and Methods

Figure 3 was created using Cytoscape version 3.6.1.

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Baraminology data filtering method based on entropy measurement and its application in dinosaur and cephalopod data sets

Matthew Cserhati

Several recent dinosaur baraminology studies show areas of large degrees of continuity between baramins in the BDC matrixes where there should be none. These results suggest that the baramins predicted by the BDIST method in these studies tend to over-cluster, resulting in a smaller number of baramins, with falsified, inflated species memberships.

Also, evolutionists have used the BDIST method in an attempt to discredit baraminology, by trying to show that the number of dinosaur baramins gets smaller as more species are added to the analysis. This lumps dinosaur species together, showing the continuity of all life—which is the same as biological evolution. A potential problem was identified involving low-variability characters. Many such characters together tend to increase the correlation between any two given species and could possibly cause species lumping.

A new algorithm was developed to filter out such low entropy characters, and species with a high proportion of missing characteristics. The algorithm was applied on several dinosaur and two cephalopod data sets. It significantly cleans up the data sets and increases the number of baramins reported in previous studies, but eliminates many of the species and characters. There is a trade-off between the amount of available data and data quality. This affects the outcome of morphological baraminology studies.

Baraminology has a long publication record. In general, the field attempts to lump species into baramins and holobaramins. The holobaramin is the complete list of species, both living and extinct, belonging to a specific kind. The basic tenet of baraminology is that species within a baramin are related (continuous), whereas species from different baramins do not intermix (i.e. they are discontinuous). To reach the holobaramin, one can either keep on adding species together based on different lines of evidence until no more species can be added. Conversely, the holobaramin can be defined by dividing a larger group until species cannot be split any longer legitimately.¹

The most common algorithm used is called BDIST.² It is a phenetics-based algorithm, which calculates the pairwise correlation and baraminic distance between all possible species pairs in a study, based on a set of input characters with discrete values. The algorithm then creates a statistical graph (called a baraminic distance correlation matrix, or BDC), which shows how individual species relate to each other. Optimally, species from a single baramin cluster together on the graph. The designer has refused to share the program with this author. However, it was possible to reconstruct several features of the algorithm from published descriptions of BDIST.³

Several recent morphology-based baraminology studies seemingly tend to lump too many species into a single baramin. Baramins sometimes even overlap with one another. For example, a study by O'Micks lumped all decapods into

a single holobaramin.⁴ This is a clade including organisms as diverse as squids and cuttlefish. Even evolutionists have found that the number of dinosaur baramins decreased from 50 to only eight in two studies that used the BDIST method that was developed by creationists.⁵ Wood replied in a subsequent analysis that selection of outliers, as well as a more holistic inclusion of all characters, may have given better results. Indeed, after applying these filters, his analysis gave more clear results.⁶

Following this, two recent studies lumped dinosaurs into a minimum of eight baramins,^{7,8} with the bold claim that not only are birds dinosaurs, but also that birds can be fitted into a morphological continuum with dinosaurs. Another study by Wood⁹ lumped *Australopithecus sediba* into the human holobaramin, although others have concluded that *A. sediba* is a mixed taxon and thus no analysis of this type can be performed before separating the ape and the human bones.¹⁰ When Wood took postcranial characters into consideration, he then changed his position, and stated that *A. sediba* was an australopith.¹¹

The question arises, how far can we go with continually lumping species into a single holobaramin? How long can we continue decreasing the number of holobaramins, which individually have an ever-growing membership? Does it seem that baraminology methods would even seem to support evolutionary theory and the interrelatedness of all species? Whereas baraminologists are lumpers at a certain level, lumping can incorrectly be taken to an extreme. Using our

scientific intuition, we should be able to break down large, over-lumped species clusters into smaller groups.

A recent review of baraminology methods by Cserhati and Tay¹² has indicated several problems with morphology-based baraminology methods, such as the BDIST method, and has also suggested possible solutions to improve these methods, some of which are described below. Basically, the BDIST method is usable, although it should be refined and further developed.

On a practical level, it is important to note that many such data sets are messy, with many species having only partial data. For example, approximately two thirds of the Brusatte *et al.*¹³ data set of dinosaur remains used in a recent baraminological analysis by McLain *et al.*⁷ had undetermined character values. The other four data sets these authors used had between 54.2–69.8% undetermined character values. If a species has too many missing characters, its decreased information content may skew its relationship to other species. Missing data at a low level might be tolerable to some degree, but it's an entirely different picture if more than half of the data is missing. This highlights the necessity of using more complete, quality data sets.

Furthermore, it is of utmost importance to select relevant characteristics (whenever possible), which are diagnostic of one of several baramins under study. Such diagnostic characters have the following characteristics: 1. They clearly differentiate between baramins, meaning that they are not uninformative or too general; 2. They have been measured for healthy adult individuals (and not juvenile or deformed individuals); 3. The measured character is not broken or fragmentary; and, 4. The character can be assigned an integer value (e.g. 0 = sagittal crest absent, 1 = present). In the case of continuous variables, character values can be put into range bins, or given binary values (e.g. 0 = < 5 mm, 1 = > 5 mm).

Selection of diagnostic character traits stems from the creationist presupposition that different kinds of plants and animals can be visibly and intuitively distinguished from one another. For example, birds are clearly separate from reptiles, because they were both created on separate days (Genesis 1:20–25).

However, there is a robust and long-standing discussion about character trait selection in the field of taxonomy. Character inclusion vs exclusion is a well-known problem. Most taxonomists have given up on character selection because observer bias so often influences it. Thus, most in the field have adopted a 'throw everything at the wall and see what sticks' approach and most modern taxonomical methods can deal with uninformative traits easily.

But in order to achieve *the* perfect classification of a given set of species, we would need to measure every single conceivable trait of all species in our study. This would involve thousands, even millions, of characters. This is clearly infeasible. A character selection scheme will always

be imperfect. We simply have to accept this fact because we do not know everything.

On the other hand, what would happen if we were to study the osprey, the hammerhead shark, the boll weevil, the fruit fly, mouse, human, and the alga *Volvox*? What if the characters that we selected for study were these: does it have DNA? Is it multicellular? Is it eukaryotic? Does it have a cell membrane? This way all seven species would be classified into the same group. Clearly, we have to get rid of general characters (i.e. warm-bloodedness in a study of mammals).

For example, many bird species have air sacs which intrude into their bones, such as their femur. The femur of birds is immobile, and located within the body, in contrast with reptiles. Furthermore, the hip structure of birds differs from that of dinosaurs, which can be classified into one of two main categories, either lizard-style hips (Saurischia) or bird-style hips (Ornithischia). It is a paradox that birds supposedly evolved from Saurischian dinosaurs, which have a different hip structure.¹⁴ Birds have a closed, cup-shaped acetabulum, which serves as a joint between three hip bones—the ilium, ischium, and pubis. In comparison, dinosaurs all have an open, or perforated, acetabulum. The centre of gravity in birds also lies closer to its forearms compared to dinosaurs.

Also, the brain structure of birds and reptiles is very different. Reptiles have relatively larger olfactory bulbs compared to birds. Birds and reptiles occupy different curves on a log-log graph plotting encephalic (brain) volume according to adult body mass.¹⁴ Birds are endothermic as opposed to reptiles, which are ectothermic. Birds have a four-chambered heart, whereas reptiles only have a three-chambered heart with poor separation between the two ventricles. For a detailed discussion on the anatomical differences between birds and reptiles/dinosaurs, see Thomas and Sarfati, 2018.¹⁵ If we used these as diagnostic features, birds and dinosaurs would clearly form distinct groups.

But there are other features birds and dinosaurs share in common. For example, birds and reptiles are both oviparous. They also have scales and claws on their feet. If we included these characters in a morphometric analysis it could cloud the results.

Due to these considerations, this paper presents a baraminology data filtering method based on the measurement of the entropy value of different characters. Entropy is a mathematical measure of the variety of a given data set. Other authors describe it as the 'surprisability' of a given character. For example, if all of the specimens had the same value for a certain character, this character would be too general, and would hardly be useful in distinguishing two baramins (e.g. both birds and dinosaurs lay eggs). The 'entropy' of such a character is low. On the other hand, if multiple states exist for a single character, with an equal or almost equal number of species taking up different values of that character, the entropy for such a character would be high. The present

method achieves data filtering by filtering out species with a high percentage of undefined characters, and by filtering out characters with low entropy (low character variation, meaning non-diagnostic, ambiguous traits).

Results and discussion

Re-analysis of two cephalopod data sets

For both cephalopod data sets, the major problem was reducing the large tentative decapod holobaramin into smaller groups. The Decapodiformes superorder includes squid and cuttlefish and is made up of the orders Sepiida, Sepiolida, Spirulida, and Teuthida. Therefore, it would be intuitive to find at least two smaller groups within Decapodiformes. Compared to the dinosaur data sets, a much smaller proportion of characters were undefined (21.7% and 30.4% of the Lindgren¹⁶ and Sutton¹⁷ data sets). Their mean pre-filter entropy values were also relatively higher than that of the dinosaur data sets (0.528 and 0.462, respectively). Their post-filter data reduction was also relatively less than that of the dinosaurs.

For the Lindgren data set, a ‘maximum row and column undefined percentage’ of 15% and a ‘minimum entropy value’ of 0.35 was selected prior to running BDIST. These were relatively severe cutoff values, but which increased the mean entropy to 0.72, with a 10.3-fold reduction in data, with a loss of 33 species and 84 characters. With a BDIST character relevance cutoff of 0.75, it was possible to separate eight species within the orders Sepiida, Sepiolida, and Spirulida from the rest of the Decapodiformes holobaramin (figure 1). The stress graph in supplementary figure 1 shows a minimum unscaled stress value of 0.085 at six dimensions. These groups include species such as cuttlefish. Two



Figure 1. BDC results for the filtered Lindgren *et al.*¹⁶ data set as analyzed in O'Micks⁴. Black squares indicate significant positive correlation, whereas grey squares indicate significant negative correlation.

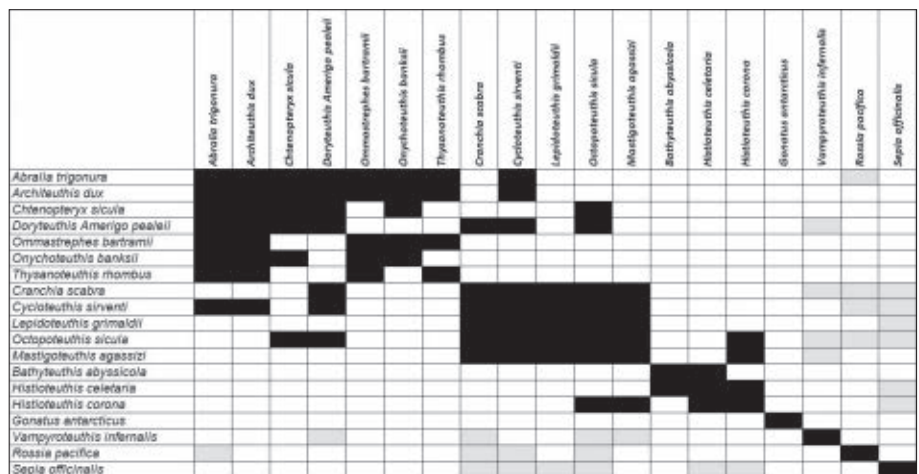


Figure 2. BDC results for the filtered Sutton *et al.*¹⁷ data set as analyzed in O'Micks⁴. Black squares indicate significant positive correlation, whereas grey squares indicate significant negative correlation.

Octopodiformes species remained after the filtering, namely *Eledone cirrosa* and *Opisthotethis sp.* The remaining 35 species all belonged to the order Teuthida, or squids. It is notable that in this analysis, *Vampyroteuthis infernalis* is reclassified as a decapod, as opposed to octopod as in earlier studies.⁴

According to the entropy filter of the Sutton¹⁷ study, nine species and 78 characters were filtered out. A maximum row and column undefined percentage of 30% and a minimum entropy value of 0.25 was selected. The mean character

entropy rose from 0.462 to 0.698. Only a relatively mild data reduction of 3.6-fold was achieved. A BDIST relevance cutoff of 0.75 was applied to the filtered data set. The results of the BDIST analysis can be seen in figure 2. The stress graph in supplementary figure 2 shows a minimum unscaled stress value of 0.034 at nine dimensions.

The bootstrapping values of both cephalopod data sets were combined to get three decapod holobaramins by selecting species pairs with a bootstrap value ≥ 95 in at least one of the two studies. This way we break down the order Teuthida into two suborders, Oegopsina and Myopsina, besides a group of three orders, namely Sepiida+Sepiolida+Spirulida (figure 3). The BDIST algorithm itself also allows for the setting of a character relevance cutoff value, which filters out characters that are present at a proportionately smaller percentage than the cutoff.

Re-analysis of four dinosaur data sets

Figure 17 of McLain *et al.*⁷ shows the BDIST analysis of 78 species coming from a data set by Brusatte *et al.*,¹³ which seemingly partition into four groups. However, these groups show continuity not only between themselves but also between each other. The BDIST results of this data set was too messy, because it appears that even though there are four main clusters, species from these clusters are continuous with one another to a large extent. Therefore, the whole data set was subjected to entropy filtering.

The parameters used during the data filtering and the BDIST re-analysis for each of the four dinosaur data sets studied by McLain are available in table 1. These parameters include the maximum unknown character per row, maximum unknown character per column, minimum character entropy, and the BDIST relevance cutoff. Table 2 contains the parameter values of certain characteristics in the four data sets, pre- and post-filter (number of species, number of characters, % undefined values, and mean entropy).

A maximum undefined character percentage of 35% per row and 35% per column as well as a minimum entropy percentage per column of 35% was set. This resulted in a reduction in the number of characters from 853 to 370, and the number of species was reduced from 152 to 19 (because many closely related species became indistinguishable without those characters). This meant a data reduction of 18.4-fold, but the mean character entropy rose greatly from 0.113 to 0.774.

The BDIST algorithm was re-run on these 19 species, with a relevance cutoff of 0.95. The stress graph shows a minimum unscaled stress value of 0.02 at six dimensions. The BDC results (figure 4) show four clusters, with one cluster of six species showing significant discontinuity with the other three groups, made up of 13 species. These six species are *Tyrannosaurus rex*, *Tarbosaurus bataar*, *Alioramus*, *Daspletosaurus*, *Gorgosaurus libratus*, and *Albertosaurus sarcophagus*. These six species are morphologically similar and all fall into the superfamily Tyrannosauoidea. The stress graph in supplementary figure 3 shows a minimum

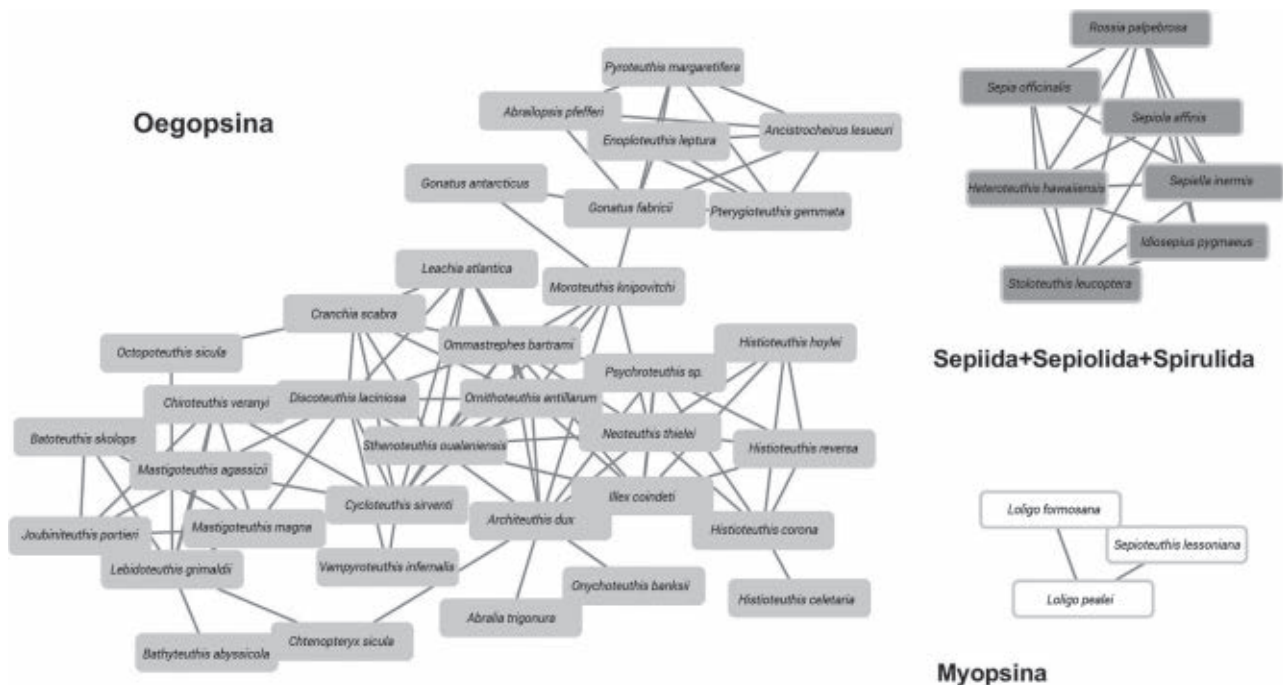


Figure 3. Graphical visualization of species pairs coming from at least one of the filtered and reanalyzed Lindgren *et al.*¹⁶ and Sutton *et al.*¹⁷ data sets, with a minimal bootstrap value of 95%.

unscaled stress value of 0.02 at six dimensions.

One of these species, however, namely *Alioramus*, does not show discontinuity with four other species in this study, namely *Guanlong*, *Dilong paradoxus*, *Sinraptor dongi*, and *Allosaurus fragilis*. Analysis of the Lee *et al.*²¹ data showed that *T. rex* showed continuity between two of these species, namely *S. dongi* and *A. fragilis*. Therefore, these four other species may be part of the Tyrannosauroida group as well.

The nine other species not mentioned yet are *Sinorthomimus*, *Struthiomimus altus*, and *Gallimimus bullatus* in one smaller group of three species and six species in another group: *Citipati osmolskae*, *Velociraptor mongoliensis*, *Deinonychus antirrhopus*, *Bambiraptor feinbergi*, *Shuvuuia deserti*, and *Archaeopteryx lithographica*. These two subgroups show neither continuity nor discontinuity between themselves. Therefore, with this study we cannot make a definitive statement as to whether they form one or two holobaramins.

Figure 32 of the McLain study⁷ shows the BDC analysis results of the Lee *et al.*²¹ study. The results seem to be too messy, although two large groups are apparent in the figure. Therefore, this data set was also subjected to entropy filtering. A maximum undefined character percentage of 50% per row and 50% per column as well as a minimum entropy percentage per column of 20% was set. This way the number of characters was reduced from 1,549 to 828, and the number of species was reduced from 120 to 15. This meant a data reduction of 15-fold, but the mean character entropy rose greatly from 0.104 to 0.686.

Table 1. Parameters used for data filtering and BDIST re-analysis

Study	Maximum unknown character per row	Maximum unknown character per column	Minimum character entropy	BDIST relevance cutoff value
Lindgren <i>et al.</i> ¹⁶	0.15	0.15	0.35	0.75
Sutton <i>et al.</i> ¹⁷	0.3	0.3	0.25	0.75
Senter ⁵	0.5	0.5	0.25	0.75
Brusatte <i>et al.</i> ¹³	0.35	0.35	0.35	0.95
Lee <i>et al.</i> ²¹	0.5	0.5	0.2	0.95
van der Reest and Currie ²²	0.35	0.35	0.2	0.75
Lamanna <i>et al.</i> ²³	0.5	0.5	0.25	0.75

The BDIST algorithm was re-run on these 15 species, with a relevance cutoff of 0.95. The stress graph shows a minimum unscaled stress value of 0.0225 at 10 dimensions. The BDIST results show three main clusters with at least two species, besides several singleton species (figure 5). The stress graph in supplementary figure 4 shows a minimum unscaled stress value of 0.022 at ten dimensions. The first cluster is made up of eight species, *Majungasaurus*, *Tyrannosaurus*, *Dilophosaurus*, *Eustreptospondylus*, *Baryonyx*, *Sinraptor dongi*, *Ceratosaurus*, and *Allosaurus*. Three species, *Velociraptor*, *Deinonychus*, and *Archaeopteryx*, form a smaller group. Two Ornithomimosaurians form another smaller group of two species in the BDIST results in the upper-right corner.

Figure 56 of the McLain study depicts what could be either three or four clusters from the van der Reest data set.²² Therefore, entropy filtering was applied to the species in this data set. A maximum undefined character percentage of 35% per row and 35% per column as well as a minimum

Table 2. Changes in different data sets after entropy filtering

Data set	Pre-filter				Post-filter				Data reduction
	species	characters	% undef.	mean entropy	species	characters	% undef.	mean entropy	
Lindgren <i>et al.</i> ¹⁶	78	101	21.7%	0.528	45	17	5.5%	0.720	10.3x
Sutton <i>et al.</i> ¹⁷	28	132	30.4%	0.462	19	54	3.6%	0.698	3.6x
Senter ⁵	89	364	49.7%	0.379	42	215	10.1%	0.726	3.6x
Brusatte <i>et al.</i> ¹³	152	853	65.6%	0.113	19	370	17.4%	0.774	18.4x
Lee <i>et al.</i> ²¹	120	1,549	69.8%	0.104	15	828	16.8%	0.686	15.0x
van der Reest and Currie ²²	93	366	54.2%	0.286	22	229	10.0%	0.730	6.8x
Lamanna <i>et al.</i> ²³	41	230	61.6%	0.113	9	173	20.2%	0.793	6.1x

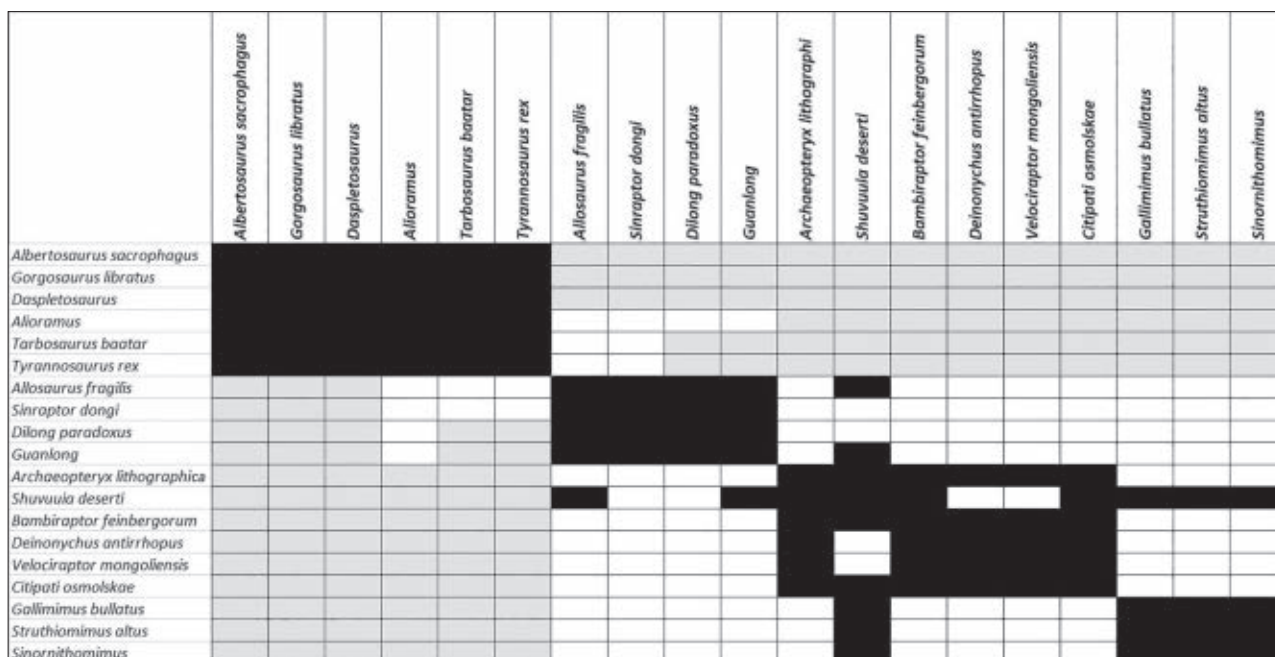


Figure 4. BDC results for the Brusatte et al.¹³ data set. Data set. Black squares indicate significant positive correlation, whereas grey squares indicate significant negative correlation.

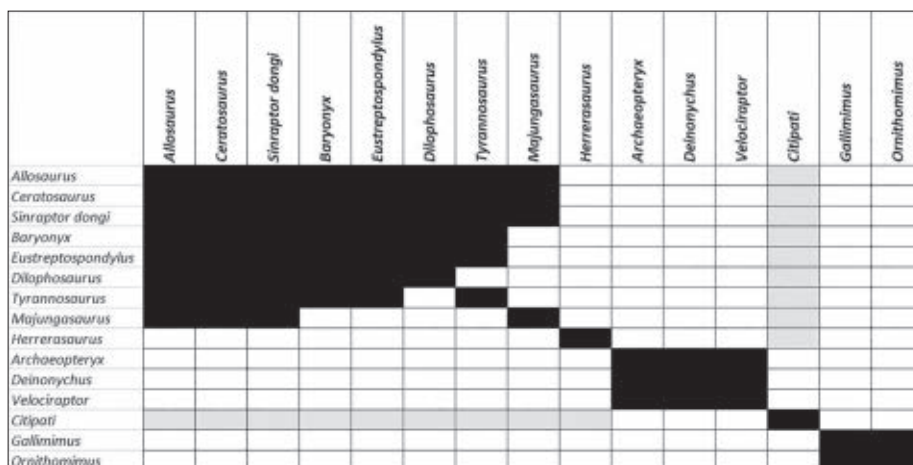


Figure 5. BDC results for the Lee et al.²¹ data set. Data set. Black squares indicate significant positive correlation, whereas grey squares indicate significant negative correlation.

entropy percentage per column of 20% was set. This way the number of characters was reduced from 366 to 249, and the number of species was reduced from 93 to 22. This meant a data reduction of 6.8-fold, but the mean character entropy rose greatly from 0.286 to 0.730. The BDIST algorithm was re-run on these 22 species, with a relevance cutoff of 0.75. The stress graph shows a minimum unscaled stress value of 0.0298 at eight dimensions.

In the BDIST results we can see four very clearly defined clusters of five, three, eight, and five species, respectively, along with a singleton species, *Shuvuuia deserti* (figure 6). The stress graph in supplementary figure 5 shows a minimum

unscaled stress value of 0.03 at eight dimensions. However, significant discontinuity exists between the third cluster of eight species and the first two clusters of five and three species. The first cluster of five species is made up of *Sinosauropteryx prima*, *Tyrannosaurus rex*, *Gorgosaurus libratus*, *Sinraptor sp.*, and *Allosaurus fragilis*. The second cluster of three species is *Ornithomimus edmontonensis*, *Struthiomimus altus*, and *Gallimimus bullatus*. There is neither discontinuity nor continuity between these

two clusters, so therefore they could possibly be part of the same holobaramin, although they may also form different holobaramins.

There is a large degree of discontinuity between these species and the following two clusters. The third cluster of eight species is made up of *Confuciusornis sanctus*, *Velociraptor mongoliensis*, *Deinonychus antirrhopus*, *Bambiraptor feinbergi*, *Mei long*, *Gobivenator mongoliensis*, *Archaeopteryx lithographica*, and *Anchiornis huxleyi*. The last cluster of five species includes *Khaan mckennai*, *Ingenia yanshini*, an unnamed oviraptorid IGM100-42, *Citipati osmolskai*, *Caudipteryx sp.*, and *Confuciusornis*

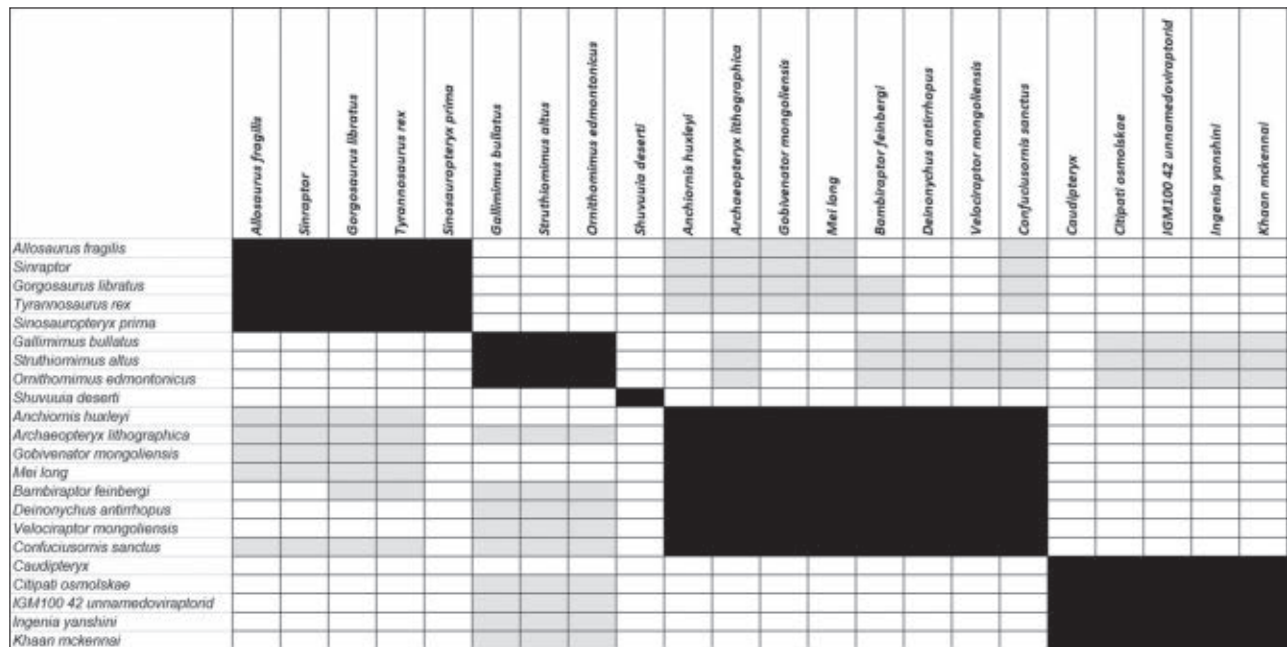


Figure 6. BDC results for the van der Reest and Currie²² data set. Black squares indicate significant positive correlation, whereas grey squares indicate significant negative correlation.

sanctus. There is neither discontinuity nor continuity between these two clusters, so therefore they may be part of the same holobaramin, but they may also form different holobaramins.

Figure 64 of the McLain *et al.*⁷ study depicts BDIST results from the Lamanna *et al.* study.²³ In this study, 41 species were studied with 230 morphological characters. A maximum undefined character percentage of 50% per row and 50% per column as well as a minimum entropy percentage per column of 25% was set. Entropy filtering reduced the number of characters from 230 to 173. This meant a data reduction of 6.1-fold, but the mean character entropy rose greatly from 0.113 to 0.793. The BDIST algorithm was re-run on these 22 species, with a relevance cutoff of 0.75. The stress graph shows a minimum unscaled stress value of 0.084 at five dimensions.

Three clusters of two, eight, and three species are visible in the BDIST results (figure 7). The stress graph in supplementary figure 6 shows a minimum unscaled stress value of 0.086 at five dimensions. There is visible discontinuity

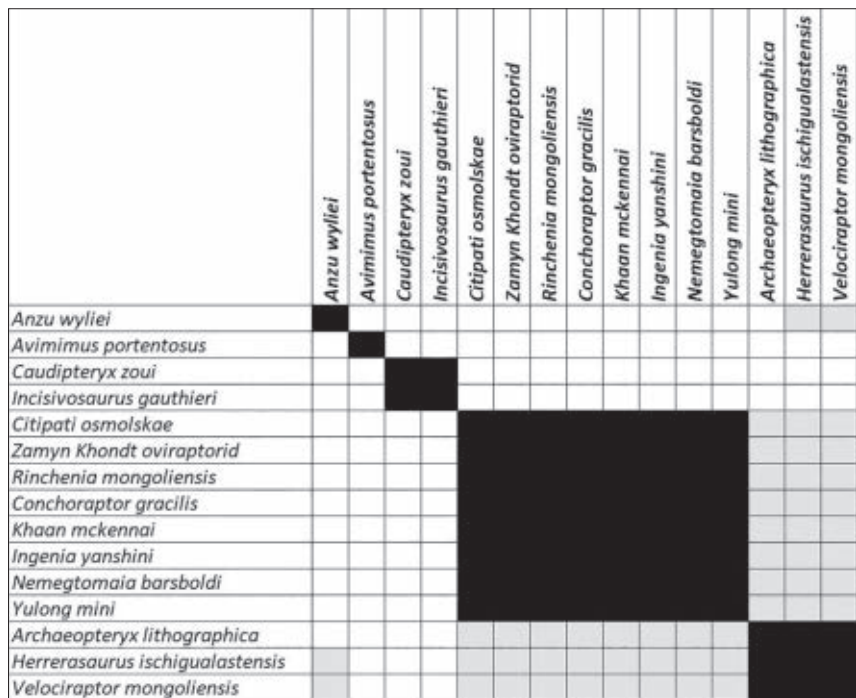


Figure 7. BDC results for the Lamanna *et al.*²³ data set. Black squares indicate significant positive correlation, whereas grey squares indicate significant negative correlation.

between the third cluster and the previous two clusters. The first cluster includes two species: *Incisivosaurus gauthieri* and *Caudipteryx zoui*. The second, larger cluster consists of eight species: *Yulong mini*, *Nemegtomaia barsboldi*, *Ingenia*

Table 3. List of different dinosaur species found by different combination of studies

Studies	No. of species	Species
Brusatte <i>et al.</i> ¹³ , Lee <i>et al.</i> ²¹ , van der Reest and Currie ²² , Lamanna <i>et al.</i> ²³	3	<i>Archaeopteryx lithographica</i> , <i>Velociraptor mongoliensis</i> , <i>Citipati osmolskae</i>
Brusatte <i>et al.</i> ¹³ , Lee <i>et al.</i> ²¹ , van der Reest and Currie ²²	6	<i>Deinonychus antirrhopus</i> , <i>Allosaurus fragilis</i> , <i>Tyrannosaurus rex</i> , <i>Ornithomimus edmontonicus</i> , <i>Gallimimus bullatus</i> , <i>Sinraptor dongi</i>
Brusatte <i>et al.</i> ¹³ , van der Reest and Currie ²²	5	<i>Gorgosaurus libratus</i> , <i>Bambiraptor feinbergi</i> , <i>Struthiomimus altus</i> , <i>Confuciusornis sanctus</i> , <i>Shuvuuia deserti</i>
Lee <i>et al.</i> ²¹ , Lamanna <i>et al.</i> ²³	1	<i>Herrerasaurus ischigualastensis</i>
van der Reest and Currie ²² , Lamanna <i>et al.</i> ²³	3	<i>Khaan mckennai</i> , <i>Caudipteryx zoui</i> , <i>Ingenia yanshini</i>
Brusatte <i>et al.</i> ¹³	14	<i>Ichthyornis</i> , <i>Haplocheirus</i> , <i>Guanlong</i> , <i>Albertosaurus sarcophagus</i> , <i>Garudimimus brevipes</i> , <i>Dilong paradoxus</i> , <i>Sinornithomimus</i> , <i>Falcarius</i> , <i>Daspletosaurus</i> , <i>Ornitholestes hermanni</i> , <i>Sapeornis</i> , <i>Alioramimus</i> , <i>Compsognathus longipes</i> , <i>Tarbosaurus baatar</i>
Lamanna <i>et al.</i> ²³	8	<i>Zamyn Khondt oviraptorid</i> , <i>Avimimus portentosus</i> , <i>Yulong mini</i> , <i>Nemegtomaia barsboldi</i> , <i>Conchoraptor gracilis</i> , <i>Anzu wyliei</i> , <i>Rinchenia mongoliensis</i> , <i>Incisivosaurus gauthieri</i>
Lee <i>et al.</i> ²¹	5	<i>Ceratosaurus</i> , <i>Eustreptospondylus</i> , <i>Dilophosaurus</i> , <i>Baryonyx</i> , <i>Majungasaurus</i>
van der Reest and Currie ²²	5	IGM100 42 unnamed oviraptorid, <i>Anchiornis huxleyi</i> , <i>Gobivenator mongoliensis</i> , <i>Mei long</i> , <i>Sinosauroptryx prima</i>

yanshini, *Khaan mckennai*, *Conchoraptor gracilis*, *Rinchenia mongoliensis*, *Zamyn Khondt*, and *Citipati osmolskae*. There being neither continuity nor discontinuity between these two groups we cannot yet say whether these two groups form one or two holobaramins. The third group, however, clearly separates from the first two clusters. This third group is made up of three species: *Velociraptor mongoliensis*, *Herrerasaurus ischigualastensis*, and *Archaeopteryx lithographica*.

Table 3, column 3, lists 50 dinosaur species found in the BDIST analyses of the reduced morphology matrixes after entropy filtering. For each species the corresponding set of studies is listed in the first column. This same information is depicted in the Venn diagram in figure 8. In this figure each possible combination of 15 data sets shows the number of species that were discovered in that particular combination of data sets. For example, according to table 3 and figure 8, three species—*Archaeopteryx lithographica*, *Velociraptor mongoliensis*, and *Citipati osmolskae*—were found by the Brusatte, Lee, Lamanna, and van der Reest data sets.

All of these results can be summed up into a single baraminic classification. For each of the four analyses, we can take those species pairs where the bootstrapping results have a value higher than 95%. These species pairs would then form an edge in a graph. The thickness of such an edge would be proportionate to the number of studies that this species pair shows up in (1–4). This species graph can be seen in figure 9, which shows three holobaramins with 22, 12, and

four species, respectively. These 38 species are all theropod saurischian dinosaurs, and are listed in supplementary table 1, along with their cluster number, as well as their taxonomic classification into order, clade, and superfamily/family.

The first, largest holobaramin is called Maniraptora, with 22 species. This holobaramin could possibly be split up into two smaller monobaramins of 10 and 12 species, respectively, called Avialae and Oviraptosauria. These species come from a number of different families, including *Alvarezsauridae*, *Anchiornithidae*, *Archaeopterygidae*, *Confuciusornithidae*, *Dromaeosauridae*, *Herrerasauridae*, and *Troodontidae*.

The second group is called Tyrannosauroidae and contains species coming from six different reptile families/superfamilies, namely *Tyrannosauridae*, *Allosauridae*, *Ceratosauridae*, *Proceratosauridae*, *Megalosauridae*, and *Metriacanthosauridae*. Members of Tyrannosauroidae differ little in their morphology from species to species and are characterized by short forelimbs on robust pectoral girdles, with only two fingers. They have relatively large skulls in proportion to their bodies.

In his study of tyrannosauroid taxa, M. Aaron concluded that the family *Tyrannosauridae*+*Bistahieversor*+*Appalachiosaurus*+*Dryptosaurus*+*Raptor*+*Xiongguanlong*+*Eotyrannus* all constitute a holobaramin. The species *Eotyrannus* seemingly represents the extreme form of tyrannosauroids, with longer, grasping hands and three digits. The author also stated that with the discovery of further tyrannosauroid fossils, the definition of this holobaramin might change,

including other tyrannosauroid species, such as *Dilong paradoxus*.¹⁸ According to the results of the present study, *Dilong* is continuous with *Allosaurus fragilis*, which itself is continuous with *Tyrannosaurus rex*.

Therefore, the species *Guanlong*, *Sinraptor dongi*, *Baryonyx*, *Eustreptospondylus*, *Ceratosaurus*, and *Sinosauropteryx prima* might be added to the existing tyrannosauroid holobaramin. This could mean that species belonging to the superfamily Tyrannosauroidea all form a single holobaramin. This would include species from the family Proceratosauridae (such as *Guanlong*), which have a positive correlation with *Eotyrannus*, according to two studies.^{19,20}

The third group consists of four species, all from the family Ornithomimidae, namely *Gallimimus bullatus*, *Ornithomimus edmontonicus*, *Sinornithomimus* sp., and *Struthiomimus altus*. These species are characterized by their slender, light frame, long, slim hindlimbs, and elongated forelimbs ending in uniquely structured hands. Since there are only four species in this small group, it may be that these four species only form a monobaramin.

Entropy filtering applied to Senter, 2010 data set

Senter,⁵ an evolutionist, claims that after using the BDIST method on a data set of 40 characters for 33 fossil dinosaur species, compiled in 2009, the dinosaur groups *Oviraptorosauria*, *Avialae*, *Deinonychosauria*, and Coelurosaurian outlier species all fall into a morphological continuum, implying that the application of this baraminological method decreases the number of holobaramins, and shows continuity between dinosaurs and birds. Wood⁶ responded by pointing out that Senter's selection of characters was too stringent, appealing to a holistic inclusion of most if not all characters using less stringent selection criteria. In Wood's new character matrix, taxa had at least 50% of their characters in a known state, raising the number of included taxa to 42, with 177 characters. Figure 2 of Wood⁶ shows that the distance correlation results for the larger character matrix, with less stringent criteria, shows discontinuity between *Oviraptorosauria*+*Avialae*+*Deinonychosauria* and Coelurosaurian outlier species. This study indicates that character selection influences the results of the BDIST analysis, and therefore impacts the number of holobaramins as a result.

In the present paper, an expanded data set from Senter⁵ covering 89 species and 364 characters was analyzed using the BDIST software with and without entropy filtering. Supplementary figure 7 shows the distance correlation results (relevance cutoff of 0.75), showing general high continuity between all species in the study. The species do not cluster at all into well-defined holobaramins. The stress graph in supplementary figure 8 shows a minimum unscaled stress value of 0.24 at four dimensions. This value is very high, and even shows an increase starting from 5 dimensions. This is a clear indication that this data set needs to be filtered.

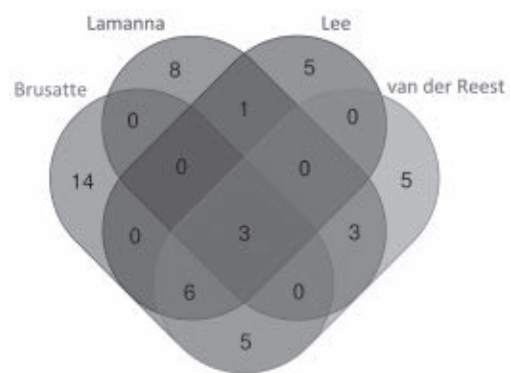


Figure 8. Venn diagram of 50 dinosaur species found in different combinations of the filtered data sets coming from the Brusatte *et al.*¹³, Lamanna *et al.*²³, Lee *et al.*²¹, and van der Reest and Currie²² data sets.

Thus, entropy filtering was applied to Senter's data set, with a maximum undefined character percentage of 50% per row and 50% per column, and a minimum entropy percentage per column set at 25%. Entropy filtering only reduced the number of species to 42 and the number of characters to 215. The mean character entropy rose greatly from 0.379 to 0.726, meaning a data reduction of 3.6-fold. The BDIST algorithm was re-run on these 42 species, with a relevance cutoff of 0.75.

In supplementary figure 9 we can see that the groups *Oviraptorosauria* and *Avialae*+*Deinonychosauria* show significant negative baraminic correlation with *Ornithomimosauria*+*Tyrannosauroida*. Both *Oviraptorosauria* and *Avialae*+*Deinonychosauria*, as well as *Ornithomimosauria* and *Tyrannosauroida* do not show significant negative baraminic correlation with each other, but neither do they show significant positive baraminic correlation. These results indicate a separation of birds from dinosaurs and are similar to the results in figure 2 in Wood.⁶ The stress graph (supplementary figure 10) shows a minimum unscaled stress value of 0.067 at seven dimensions.

Conclusions

Character selection influences the result of BDIST studies, whether all possible characters are chosen or whether they are selected based on special selection criteria. This is true, for example, when multiple protein sequence alignments are trimmed to obtain the most informative set of amino acids which produce an optimal evolutionary tree. The BDIST method was re-applied to several dinosaur morphology character sets, and, as we have seen, a reduction was made possible in the number of dinosaur baramins, averting the scenario of all species coalescing into one common baramin (which is equal to the evolutionary tree of life, suggesting general evolutionary relatedness between all species).

It must be noted here that the most optimal scenario would be to make measurements of all characters for all species,

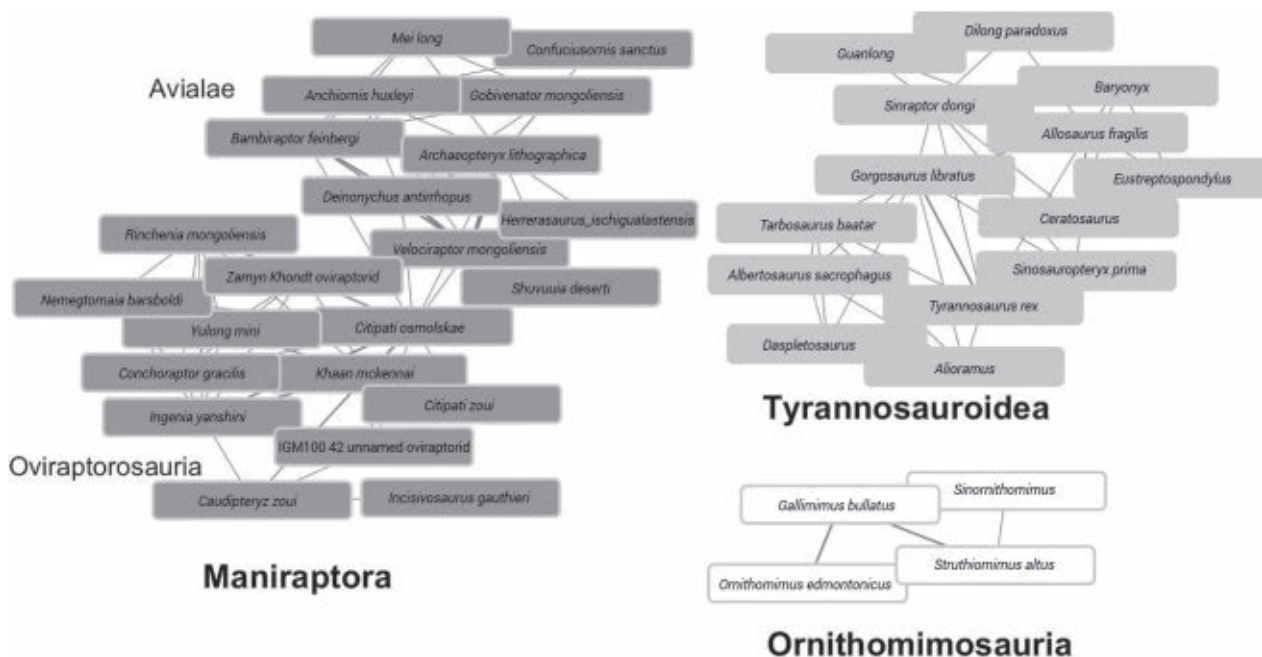


Figure 9. Graphical visualization of species pairs coming from at least one of the filtered and reanalyzed Lindgren *et al.*¹⁶ and Sutton *et al.*¹⁷ data sets, with a minimal bootstrap value of 95%.

which however is hardly possible for fossil remains. Fossil character data sets tend to be messy and easily skew results, thereby making entropy filtering of the data sets necessary. Filtering the data sets involves removing rows (species) and columns (characters) which contain too much unknown information and too little variation. This way character entropy/diversity increases, with a parallel decrease in the number of species. However, the result is that the boundary of baramins can be made much clearer. Setting cutoff values for these parameters can fine-tune BDIST correlation results.

A radical reduction in characters may also skew BDIST results. But this was necessary due to the fact that many of the data sets contained a very large percentage of missing values. Whereas the combined results in this paper show that *Oviraptorosauria*, *Avialae*, and *Deinonychosauria* form a single holobaramin, they are connected by only one species, *Citipati osmolskae*. The results from Wood⁶ suggest that they separate from one another, even though significant baraminic discontinuity is lacking. However, when the 2010 Senter data set was subjected to entropy filtering, *Oviraptorosauria* separate from *Avialae+Deinonychosauria*, but also *Ornithomimosauria* and *Tyrannosauroidae*, do not show significant baraminic continuity with one another, suggesting four baramins.

Materials and methods

The entropy filter algorithm was applied to 90 cephalopod and 227 dinosaur species from four data sets. The goal was to refine at times overlapping baraminic predictions which have

possibly been over-lumped into a smaller number of possible holobaramins. This was done on the Lindgren¹⁶ and Sutton¹⁷ cephalopod data sets, and the Brusatte¹³, Lee²¹, van der Reest²², and Lamanna²³ dinosaur data sets. The BDIST results of the Zanno²⁴ dinosaur data set showed that the discovered putative baramins were well-segregated enough so as to make further analysis using the entropy filter unnecessary.

For each data set, a small subset of species was identified which made up what was deemed to be an over-lumped cluster. Character entropy filtering was performed on these species within the data set. The BDIST method was re-run on the remaining filtered data set to see if the entropy filtering was able to split up the selected species into a larger number of baramins, each with a smaller species membership.

The results of data filtering and reclustering are reported here. For the analysis of each data set the original data set is included as well as a list of species for which entropy filtering was done. Furthermore, the filtered character set and the BDIST results are also provided for each analysis in a separate Excel file, which are available on github.com/csmaty/EntropyFilter.

Data sets for the cephalopod and dinosaur baraminology studies listed in table 1 were downloaded. The script EntropyFilter.R was written in R studio, version 1.1.442. The script itself, as well as supplementary figures and data files, are available on the github web page.

The script applies several filters to the data. First, it filters out those species which have a percentage of undefined (“?”) characters above a certain cutoff. Next, it selects those species which are over-lumped. The names of these species

should be listed in a separate txt file. The third filtering step is the most important and is essential to the whole method. This filtering step involved calculating entropy for each character. A column of character values is extracted from the double-filtered data set. Those characters are filtered out, and contain a certain percentage of undefined characters, just as with the row filtering criterion. Shannon entropy is calculated for each of the characters, minus the undefined states of a given character. Mixed characters, such as {0,1} are treated as separate characters (thus, 0, 1, and {0,1} count as three states of a given character). Shannon entropy is calculated in the following manner for a given character j:

$$H_j = - \sum_{i=0}^n p_i \log_n p_i$$

Where n is equal to the number of states for character j, p_i is equal to the probability of observing state i of the given character, and is equal to the number of occurrences of state i/the total number of occurrences for a character j. A minimum undefined character ratio for rows and columns and a minimal entropy value was selected for all data sets.

Figures 3 and 9 were made using Cytoscape version 3.7.1. The bootstrapping values of the BDIST results of the entropy-filtered Brusatte, Lee, Lamanna, and van der Reest analyses were combined. An edge was placed between two species (vertices) if their bootstrapping value was $\geq 95\%$. Edge thickness was adjusted to reflect the number of BDIST studies which showed continuity between a given pair of species.

The baraminic distance correlation matrix as well as the stress graphs for all studies were generated using the BDIST software at coresci.org/bdist.html. The Venn diagram (figure 9) was created using the software available at bioinformatics.psb.ugent.be/webtools/Venn/.

Acknowledgements

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Baraminology suggests cryptic relationships among Caprimulgiformes

Matthew Cserhati and Jon Alquist

Caprimulgiformes is a group of five bird families including animals such as nighthawks and nightjars. At first sight they morphologically resemble owls. However, a study of 390 Kbp in 198 birds seemingly shows that they are more similar genetically to a group of birds called Apodiformes, which include swifts and hummingbirds. Why is there such a big disparity between morphology and genomics? The aim of this study was to combine both genomics-based and morphology-based baraminology methods to decipher the baraminic relationships between 87 species of birds from Caprimulgiformes, Strigiformes, and Apodiformes. Genomics-based methods include the analysis of mitochondrial DNA data, whole proteomes by the Gene Content Method, whole genome sequences by the Whole Genome K-mer Signature method, and a morphological data set by the BDIST method. Preliminary results indicate that Aegothelidae clusters with Apodiformes, based on morphology and genetics. Caprimulgiformes likely clusters with Strigiformes based on genetic results. Nyctibiidae needs more analysis. Podargidae and Steatornithidae cluster together and away from Apodiformes.

The avian order Caprimulgiformes, as traditionally constituted, includes 130 species in five families: Caprimulgidae, nightjars or nighthawks (97 species); Nyctibiidae, pootos (7 species); Steatornithidae, oilbird or guacharo (1 species); Podargidae, frogmouths (16 species); and Aegothelidae, owllet-nightjars (9 species).¹ They are characterized by cryptic colouration, lax plumage, small beaks with a large gape, and small feet. Most have moderately long wings and tails for maneuverability in flight. See figure 1 for representative species from each family.

Our Creator has designed them for a narrow behavioural niche. They are the only avian group that is almost exclusively crepuscular (active mainly at dawn and dusk). Despite having large eyes and tapida lucida (a layer of tissue directly behind the retina), they are not capable of foraging visually in darkness and are only uncommonly seen aboard by day (except for some Chordeiles species that are diurnal as well as crepuscular). Although they can hunt on fully moonlit nights, their needs are met primarily during a four-hour period of the day, two hours near dusk and two near sunrise. Some data indicate that nightjars may time their breeding to coincide with a full moon for maximum provisioning of their young. Unlike owls they do not possess the acute hearing to enable prey location solely by sound. The oilbirds do use a form of echolocation to find their way in caves where they nest, but this consists of audible clicks that are not fine-tuned in the manner of bats.

During the day, nightjars roost in leaf litter or on branches where they mimic a broken stump. While the eye seems to be closed, the birds can see through a narrow slit between the upper and lower eyelids. The potoos are unique in possessing two tiny slits in the upper eyelid through which vision is

possible while the large yellow eye itself is not visible. This design was called the “magic eye” by Sick who pictured it on page 300 of his book.²

The early work on the relationships of the Caprimulgiformes is summarized by Sibley and Ahlquist.³ Most systematists have not seriously questioned the monophyly of the group. Their nearest relatives have been thought to be either the owls (Strigiformes) or the swifts and hummingbirds (Apodiformes). The DNA hybridization data of Sibley and Ahlquist supported a relationship to the owls, with the exception of a long branch to the Aegothelidae.

The phenomenon of long branches and short internodal lengths (perhaps statistically insignificant) is a feature of the Sibley and Ahlquist ‘tapestry’ and, indeed, a problem for most molecular phylogenies. If such nodes were to be collapsed, the result would not be a ‘tree’ but a ‘bush’ or a ‘starburst’ suggestive of nearly simultaneous branching events. The evolutionists are coping with this by deriving hypotheses that relate the phenomenon to the Cretaceous-Tertiary (K-T) extinction event (‘catastrophic meteorite’ or ‘extraterrestrial holocaust’ idea).^{4,5} Creationists are aware that such simultaneous radiations of bird kinds are likely the result of the cessation of the Noahic Flood.

The Caprimulgiformes, as identified in the introduction, are at least paraphyletic. The Aegothelidae consistently cluster with the swifts and hummingbirds. The study by Chen *et al.* incorporates data from morphology (including fossil taxa) and independently derived genome sequences.⁶ The authors combine the swifts and hummingbirds (Apodiformes) and owllet-nightjars (Aegotheliformes) into a larger group called Daedalornithes. To this they add the remaining



Figure 1. Different members of the five families of Caprimulgiformes: A. Barred owl-nightjar (*Aegotheles bennettii*), family Aegothelidae; B. Papuan frogmouth (*Podargus papuensis*), family Podargidae. Note the broad, heavy bill characteristic of frogmouths; C. Common potoo (*Nyctibius griseus*), family Nyctibiidae. Adult (left) and partly-grown young in the typical daytime resting posture; D. European nightjar (*Caprimuglus europaeus*), family Caprimulgidae, resting position horizontal to branch; E. Oilbird or guácharo (*Steatornis caripensis*), family Steatornithidae, at nest in cave. Photos courtesy of Wikipedia Creative Commons.

caprimulgiform groups to form an umbrella crown-group, Strisores.^{7–9}

Mayr carried out a study of the osteology of the group, including fossil forms, using parsimony.¹⁰ His results concurred with a possible relationship of the Aegothelidae with swifts and hummingbirds. A cursory examination of his figure 4 showing photographs of the skulls of *Aegotheles* and *Apus* demonstrates the similarity of their wide, lightly built skulls.

Excluding the Aegothelidae, opinions differ as to the arrangement of the other four caprimulgiform taxa. A clade of ‘Steatornithidae + Nyctibiidae’ is favoured by many authors.^{4,7,11–13} Mayr’s osteological analysis suggests a clade of ‘Nyctibiidae + Caprimulgidae’. The sequence of clades also differs among the various studies, implying a lack of congruence overall.

One might suspect, on the basis of zoogeography, that the Neotropical oilbird and potoos are closest to each other and to the Caprimulgidae, and that the Asian and Australo-Papuan Podargidae and Aegothelidae are each other’s near relatives. The newer data, as we have seen, do not uniformly support such a hypothesis, prompting a need for additional clarifying information.

This brief survey attests to a general concordance of opinion from studies of genome sequencing and detailed morphological analyses performed mainly in the last two decades. These studies are all based on phylogenetic (hence evolutionary) suppositions. The field is open for the

exploration of new data in the form of proteomes and the application of statistical baraminological analyses that do not make evolutionary assumptions. The present study provides new data bearing on some of these questions.

Purpose of study

Christopher Emerling is an evolutionary biologist studying long-term genetic adaptations at the University of Montpellier in France, and hosts a blog titled “Evolution for Skeptics”. Referring to a study by Prum *et al.*⁷ on a segment of DNA around 390 Kbp in 198 different bird species, Emerling claims that species of Strigiformes are closer to birds, such as toucans, trogons, and eagles, than Caprimulgiformes.

On the other hand, this same study seemingly shows that Caprimulgiformes is closest to a group of birds called Apodiformes, which includes hummingbirds and swifts. Hummingbirds have long tails, wings which are capable of hovering flight, eat nectar, and are colourful, quite in contrast to caprimulgiforms. Swifts are highly aerial birds, with small legs and short tails. Emerling asks why these two groups of birds (Caprimulgiformes and Apodiformes) look so different, despite their DNA similarity. Shouldn’t Caprimulgiformes be more similar to owls rather than Apodiformes? If, based on DNA similarity, Caprimulgiformes, and Apodiformes hypothetically come from the same created kind, then why did they diverge so much over the past 6,000 years?

Description of methods

It should be pointed out that the size of the DNA segment from the Prum *et al.* study was only 390 Kbp,⁷ whereas the smallest genome size of birds from the mentioned four groups is approximately 1,067 Gbp. This means that Prum *et al.* studied only about 0.037% of the entire genomes of these birds. Based on the very small size of the DNA, it is much too early to draw any strong conclusions about the genetic relationship between these four bird groups.

In contrast, two molecular baraminology algorithms have recently been developed which predict baraminic membership based on whole proteomics information (the Gene Content Method) as well as comparisons between WGKS. Since these two algorithms take global genomics/proteomics information into account, obviously they would be a preferable analysis for drawing baraminic conclusions about Accipitriformes, Apodiformes, Caprimulgiformes and Strigiformes. This paper applies the Gene Content Method¹⁴ to the proteomes of several species from these four bird groups, and the WGKS method¹⁵ to the whole genome sequences of species belonging to these groups. Additionally, a mitochondrial DNA comparison and the BDIST algorithm run on a morphological data set were performed on species mainly from Apodiformes and Caprimulgiformes, but also a smaller group of species from the other taxa as well. This

way we can get a more comprehensive picture of the relationships between these four bird groups.

Results

Biblical considerations

Leviticus 11:13–19 lists some unclean birds: “And these you shall detest among the birds; they shall not be eaten; they are detestable: the eagle, the bearded vulture, the black vulture, the kite, the falcon of any kind, every raven of any kind, the ostrich, the night-hawk, the sea gull, the hawk of any kind, the little owl, the cormorant, the short-eared owl, the barn owl, the tawny owl, the carrion vulture, the stork, the heron of any kind, the hoopoe, and the bat” (ESV). Table 1 (adapted from Bulmer, 1989¹⁶) summarizes the translations of these 20 birds from the King James Version (KJV), the New English Bible (NEB), and the English Standard Version (ESV).

From this list we can see that the Bible mentions falcons (Accipitriformes), owls (Strigiformes), and nighthawks (Caprimulgiformes), which are members of three of the four bird groups in this study. However, it is not clear as to whether owls or caprimulgiforms form one or more kinds. The three Bible versions mention four (KJV), eight (NEB), and five (ESV) species of owls/caprimulgiforms. It is interesting to note that where both the KJV and ESV use the word nighthawk for the Hebrew *tahmās*, the NEB uses the word short-eared owl. This means that nighthawks might be related to owls.

These 20 birds are listed as examples of either birds of prey, or birds which eat worms, carrion, or other impure substances. Birds which eat carrion might be carriers of disease, and birds of prey kill other animals, which is a symbol of the Fall into sin, making them unclean.¹⁷ Birds

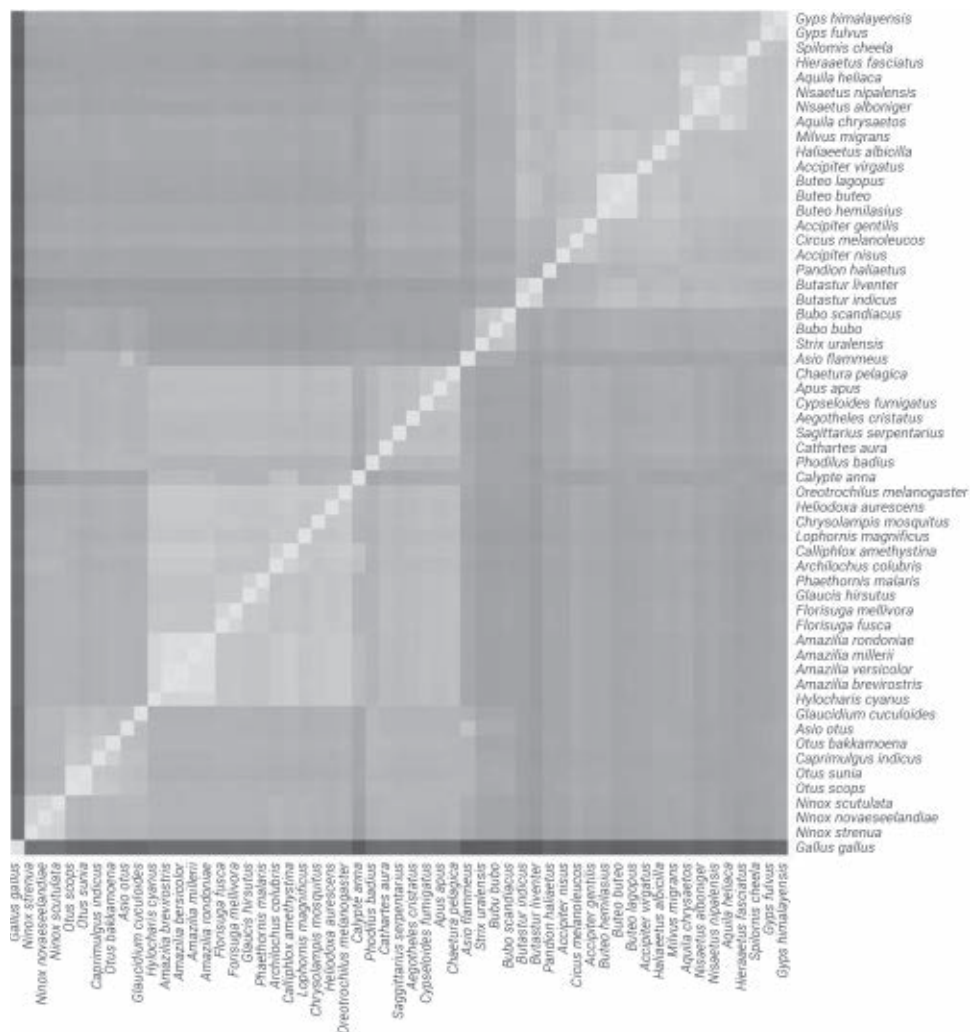


Figure 2. Heatmap of mitochondrial genome sequence similarities between 57 accipitrid, strigiform, apodiform, and caprimulgiform species. *Gallus gallus* is an outlier species. Brighter shades represent sequence similarity values, closer to 1, denoting species coming from the same baramin. Darker shades represent lower sequence similarity values, closer to 0, denoting species from different baramins.

from Apodiformes, the swifts and the hummingbirds, eat nectar and insects, the latter of which do not count as nephesh life (sentient animals). This might be another indication that nighthawks, the single Caprimulgiformes species mentioned in the list, does not belong to Apodiformes.

Mitochondrial genome alignments

The mitochondrial genome sequences for 57 species from the four orders Accipitriformes, Apodiformes, Caprimulgiformes, and Strigiformes were downloaded from the NCBI database with *Gallus gallus* as an outlier. The NCBI Reference Sequence ID as well as the mtDNA length were noted for each species in Supplementary File #1. A multiple alignment was performed for all 57 of these mitochondrial genomes. The sequence identity matrix has been visualized as a heatmap¹⁸ in figure 2. Figure 3 depicts the beeswarm

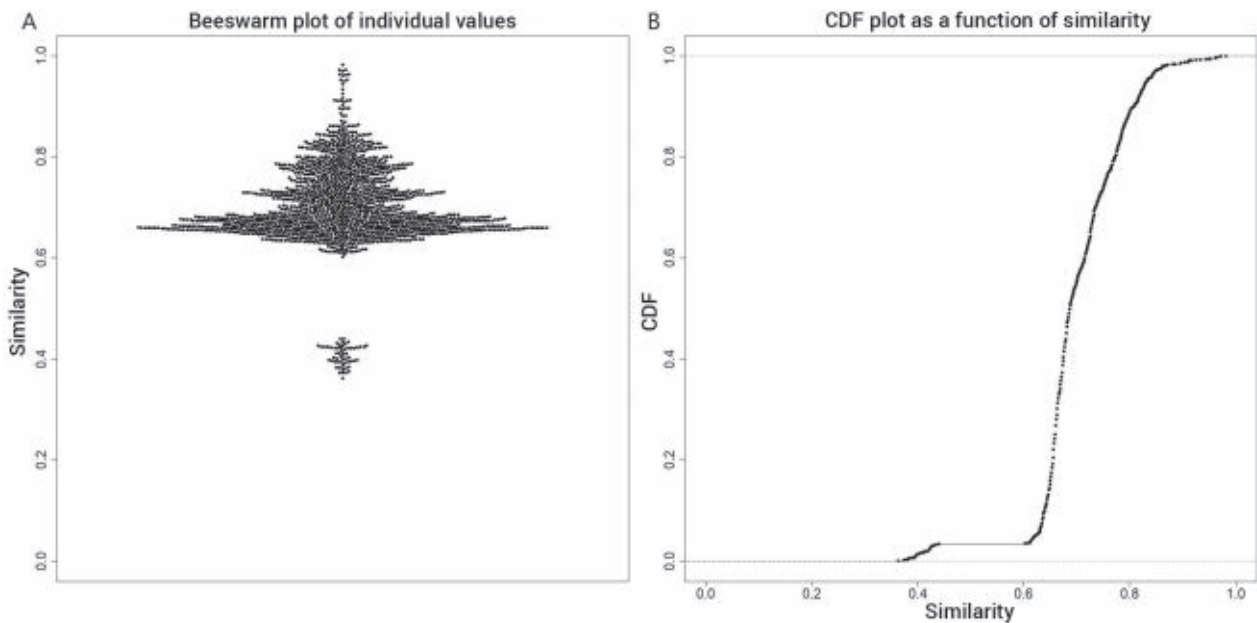


Figure 3. A. Beeswarm plot of mitochondrial genome sequence similarity values; B. ECDF plot of the same values.

Table 1. Translation of individual bird species from Leviticus 11:13–19 in several Bible translations (adapted from Bulmer, 1989)¹⁶

Hebrew term	King James Version	New English Bible	English Standard Version
nešer	eagle	griffon vulture/ eagle	eagle
peres	ossifrage	black vulture	bearded vulture
ʾozniyah	osprey	bearded vulture	black vulture
dāʾah	vulture	kite	kite
ʾayyah	kite	falcon	falcon
ʾōrēb	raven	crow/raven	raven
bat yaʾanah	owl	desert owl	ostrich
tahmās	nighthawk	short-eared owl	nighthawk
šahap	cuckoo	long-eared owl	sea gull
nēs	hawk	hawk	hawk
kôs	little owl	tawny owl	little owl
šālāk	cormorant	fisher-owl	cormorant
yanšûp	great owl	screech owl	short-eared owl
tinšemet	swan	little owl	barn owl
qāʾāt	pelican	horned owl	tawny owl
rāhām	gier-eagle	osprey	carion vulture
hasidah	stork	stork/heron	stork
ʾanāpah	heron	cormorant	heron
dūkīpat	lapwing	hoopoe	hoopoe
ʾatallēp	bat	bat	bat

plot¹⁹ and the ECDF plot of the identity values from the heatmap.

In figure 2, several groups of different sizes are visible, as well as a number of species which seem to be singletons (species clustering by themselves). The baramins predicted by k-means clustering ($k = 12$) can be seen in table 1. 53 of the 56 (94.6%) non-outlier species were clustered successfully into a group, where all groups had a p -value $< 5\%$. *Gallus gallus*, an outlier species, was by itself.

The first group (cluster #2) contains eight species, which include species from the strigiform genera *Asio*, *Glaucidium*, *Otus*, *Phodilus*, and the caprimulgiform *Caprimulgus indicus* (the jungle nightjar). Since *C. indicus* clusters together with these species, it might indicate that caprimulgiforms and some owls form the same baramin. Of the previously mentioned five genera, the first three belong to the family Strigidae, whereas *Phodilus* seems to be misplaced on the heatmap in figure 2. This species belongs to the other family of owls, Tytonidae.

The two *Asio* species, *A. flammeatus* and *A. otus*, are in very different positions from one another on the heatmap. These two species have an identity value of 0.814. However, two other owl genera show similar identity values, yet they cluster together. For example, in the genus *Otus*, *O. bakkamoena* has an identity value of 0.834 and 0.815 between *O. scops* and *O. sunia*. There is also an identity value of 0.869 between *Bubo bubo* and *Bubo scandius*.

The second group (cluster #3) contains nine species, which belong to the genera *Accipiter*, *Buteo*, *Circus*, *Haliaeetus*, and *Milvus*. These birds all belong to the family Accipitridae, subfamily Accipitrinae.

The third group (cluster #4) consists of three species from the owl genera *Strix* and *Tyto*. These two genera belong to the two extant owl families Strigidae and Tytonidae.

The fourth group (cluster #5) consists of five species from the two apodiform genera *Amazilia* and *Hylocharis*. These two genera belong to the family Trochilidae (hummingbirds).

The fifth group (cluster #6) is problematic. It consists of six species, which all belong to different orders: *Aegotheles cristatus* is one of the two caprimulgid species, yet it clusters together with three apodiform species (*Apus apus*, *Chaetura pelagica*, and *Cypseloides fumigatus*), and two accipitriform species (*Cathartes aura* and *Sagittarius serpentarius*). The two accipitriform species also belong to their own families, Cathartidae (New World vultures) and Sagittaridae (the secretarybird). Since these two species cluster away from all other accipitriforms, they might each form their own individual baramins. Lightner classifies these two families as separate baramins.²⁰ However, on the heat map, the three apodiform species cluster together, with the two accipitriforms and *A. cristatus* only loosely associated with them. Mahmood *et al.* classify this species into Apodiformes, also based on mtDNA evidence.²¹ If only the three apodiforms are used, the mean sequence identity is 0.851 (with a range of 0.844–0.861) as opposed to the mean value of 0.801 with all six species. If the three apodiforms and the two accipitriforms are treated as two separate groups, we get a mean inter-group sequence identity of 0.788. If the three apodiforms are compared to *A. cristatus* alone, the mean sequence identity is 0.791. Comparing these two sets of inter-group sequence identity values with a Student t-test gives us a p-value of 0.5425, meaning that the three apodiforms do not cluster preferentially with either the two accipitriforms or *A. cristatus*. Therefore, it might be more prudent to classify the *Apus apus*, *Chaetura pelagica*, and *Cypseloides fumigatus* all together into their own group.

Table 2. Baramins predicted by the k-means algorithm from the mitochondrial genome alignment

Baramin	Species	Mean	Stdev	Min	Max	P-value	Neglog
2	8	0.782	0.056	0.692	0.97	7.26E-10	9.139
3	9	0.821	0.048	0.763	0.972	4.01E-19	18.397
4	3	0.84	0.026	0.818	0.869	6.42E-03	2.192
5	5	0.945	0.029	0.911	0.982	5.73E-13	12.242
6	6	0.801	0.027	0.775	0.861	1.33E-10	9.877
7	4	0.862	0.035	0.839	0.916	4.14E-05	4.383
8	9	0.823	0.056	0.755	0.952	2.75E-17	16.56
9	6	0.839	0.02	0.816	0.896	8.61E-22	21.065
12	3	0.905	0.009	0.895	0.911	1.42E-09	8.848

Table 3. Species used in the Gene Content Method analysis

Species	Group	No. proteins	No. orthologs	Source	Cluster
<i>Antrastomus carolinensis</i>	Caprimulgiformes	16,878	14,005	Uniprot	1
<i>Archilochus anna</i>	Apodiformes	13,267	10,256	NCBI	2
<i>Athene cunicularia</i>	Strigiformes	27,746	17,740	NCBI	3
<i>Calypte anna</i>	Apodiformes	16,329	12,816	NCBI	4
<i>Chaetura pelagica</i>	Apodiformes	15,954	12,770	NCBI	4
<i>Gallus domesticus</i>	Outgroup	49,714	18,431	NCBI	Outlier
<i>Tyto alba</i>	Strigiformes	14,898	12,513	NCBI	1

The sixth group (cluster #7) is made up of four species in three genera, which all belong to the family Trochilidae. These are *Florisuga fusca*, *Florisuga mellivora*, *Glaucis hirsutus*, and *Phaethornis malaris*.

The seventh group (cluster #8) consists of nine species, eight of which belong to the subfamily Accipitrinae (family Accipitridae), whereas one species (*Pandion haliaetus*) belongs to the subfamily Pandioninae (ospreys). The eight accipitrine species include species from the genera *Gyps* (vultures), *Aquila*, *Hieraaetus*, *Nisaetus*, and *Spilornis* (eagles).

The eighth group (cluster #9) consists of six species of various apodiform genera: *Archilochus colubris*, *Calliphlox amethystina*, *Chrysolampis mosquitos*, *Heliodoxa aurescans*, *Lophornis magnificus*, and *Oreotrochilus melanogaster*.

Lastly, the ninth group (cluster #12) consists of three species from the strigiform genus *Ninox*, from the family Strigidae.

In total, the mitochondrial genome analysis results in two putative accipitriform baramins, four putative apodiform baramins, and three putative strigiform baramins. One of the two caprimulgid species, *Caprimulgus indicus* was classified together with owls.

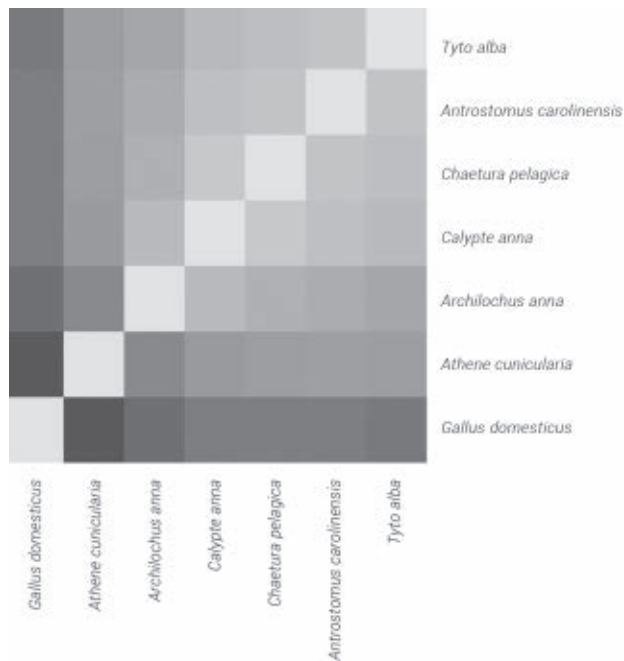


Figure 4. Heatmap of JCV values from the GCM method between eight strigiform, apodiform, and caprimulgid species. *Gallus domesticus* is an outlier species. Brighter shades represent sequence similarity values, closer to 1, denoting species coming from the same baramin. Darker shades represent lower sequence similarity values, closer to 0, denoting species from different baramins.

The beeswarm plot in figure 3A shows the spread of CC values from 0 to 1. The bulk of the CC values lie between 0.4 and 0.8. There are smaller clumps of CC values at 0.45, 0.55, 0.65, and 0.7. These correspond to humps on the ECDF plot of the CC values in figure 3B.

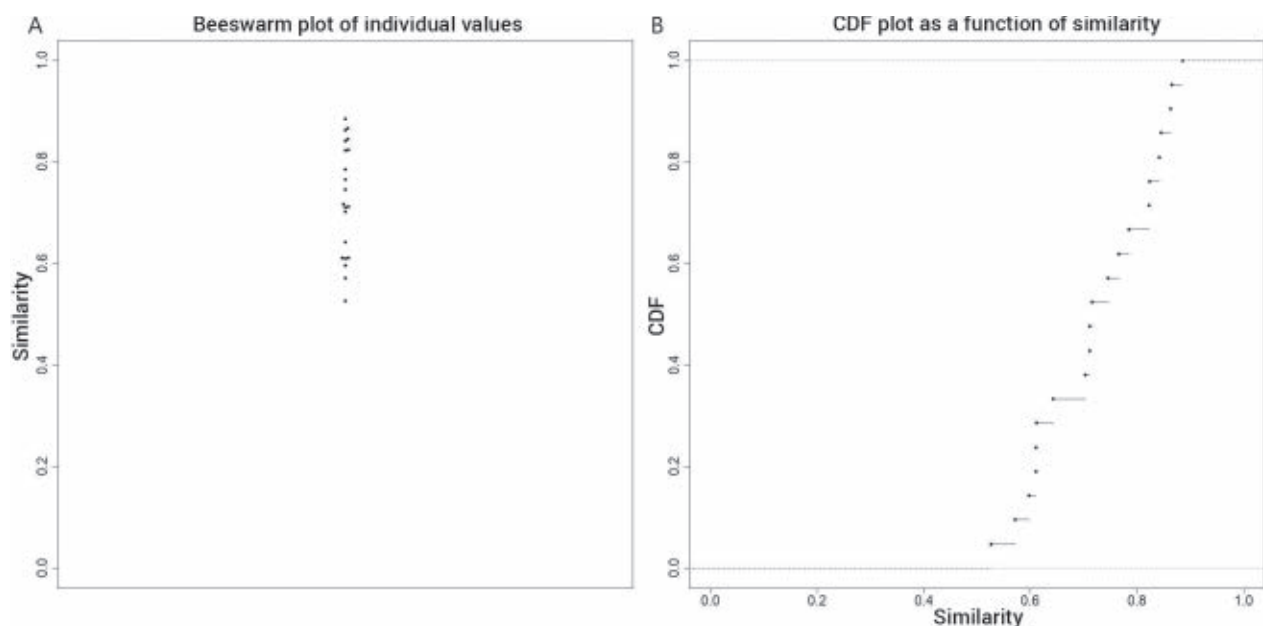


Figure 5. A. Beeswarm plot of JCV values from the GCM method; B. ECDF plot of the same values.

Gene Content Method analysis

Table 2 shows the seven species used in the GCM method. *Gallus domesticus* was used as an outlier. According to protocol, the whole proteomes of these species were mapped to orthology groups using the OrthoMCL algorithm on the EuPathDB website. Hits with a minimum of 75% similarity were selected. The number of proteins in the proteome of each species and the number of hits to the OrthoMCL database are also recorded in table 3. Supplementary File #2 contains the JCV matrix for all species.

Figure 4 depicts a heatmap of the seven species used in this study. Using the k-means clustering algorithm as a part of the GCM method, four clusters were predicted. The number of species being too low, and the number of predicted groups being relatively too high, not many decisive conclusions can be made. Table 3 describes classification of six species into different groups based on the Gene Content Method. Figure 5 depicts the beeswarm and ECDF plots for the JCV values depicted in the heat map of figure 4. There is a small cluster of JCV values above 0.8, which also corresponds to a hump on the ECDF plot at the right side of the plot.

Despite the small number of species in this study, we can still see that the two apodiform species, *Calypte anna* (Anna's hummingbird) and *Chaetura pelagica* (the chimney swift) cluster together. What is also notable is that all three owls cluster into their own separate groups. Furthermore, *Antrostomus carolinensis* (the Chuck-Will's Widow), the only species from Caprimulgiformes in this analysis, clusters together with *Tyto alba*, one of the owl species. This suggests that some Caprimulgiformes and some owls could belong to the same baramin.

Whole Genome K-mer Signature analysis

The whole genome sequence for 13 bird species from the four main groups were downloaded. Three species, *Cathartes aura*, *Haliaeetus albicilla*, and *Tyto alba* were excluded since they had genome coverage < 30x. Therefore, the Whole Genome K-mer Signature (WGKS) algorithm was used on the 10 remaining species. *Gallus domesticus* was used as an outlier. The species names, their corresponding group, as well as the length of their genome sequence and their genome coverage can be seen in Supplementary File #3.

The WGKS algorithm was run for decamers ($k = 10$). Decamers are already long enough so they can give a very specific WGKS (there are 1,048,576 possible decamers). A Pearson Correlation Coefficient matrix (CC) was calculated for these 10 species, which is also available in Supplementary File #3. K-means clustering was run on these CC values to predict baramins. Three groups and two singleton species came out of this analysis according to the k-means clustering, as seen in figure 6. The species and the putative clusters they belong to are seen in table 4. Two putative clusters with at least three species are listed in table 5. Figure 7 depicts the beeswarm and ECDF plots for the JCV values depicted in the heat map of figure 6. The CC values cluster tightly together. No separation is visible.

The two apodiforms, *Calypte anna* and *Chaetura pelagica*, form a pair. The three strigiforms also form a group, with a p-value of 0.0008. The three accipitriforms also form a group, with a p-value of $2.7E-07$. The caprimulgiform species, *A. Carolinensis*, clusters by itself and groups neither to the apodiforms nor to the strigiforms. *Gallus domesticus*, the outlier species, also does not cluster with any other species.

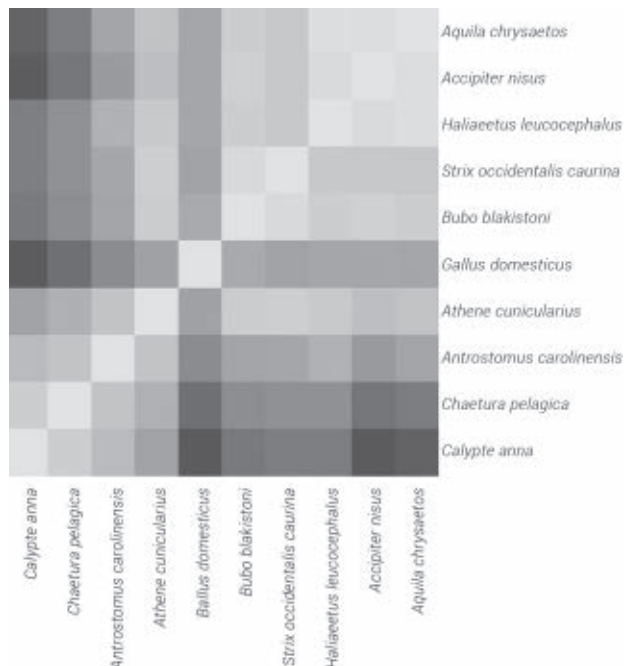


Figure 6. Heatmap of CC values from the WGKS method between nine strigiform, apodiform, and caprimulgid species. *Gallus domesticus* is an outlier species. Brighter shades represent sequence similarity values, closer to 1, denoting species coming from the same baramin. Darker shades represent lower sequence similarity values, closer to 0, denoting species from different baramins.

Morphology studies using the BDIST method

Morphological data for 17 extant and fossil Apodiformes and Caprimulgiformes species including 107 characters from a study by Nesbitt *et al.* (five were excluded, see Materials and Methods)²² were analyzed by the BDIST software using

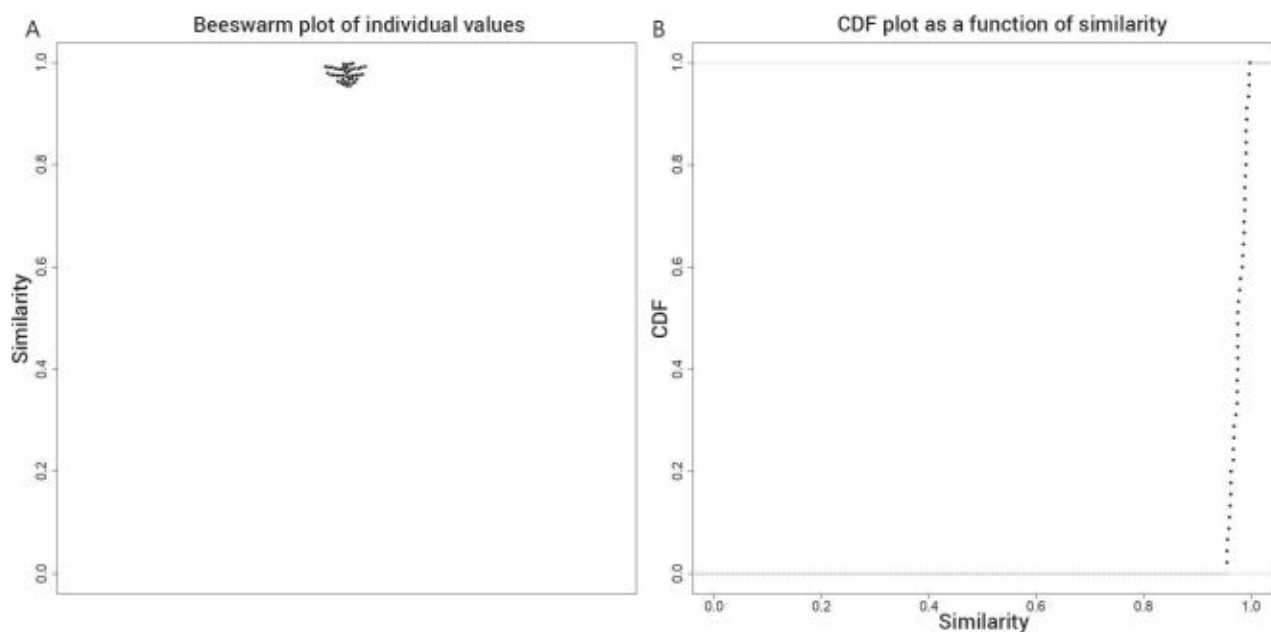


Figure 7. A. Beeswarm plot of CC values from the WGKS method; B. ECDF plot of the same values.

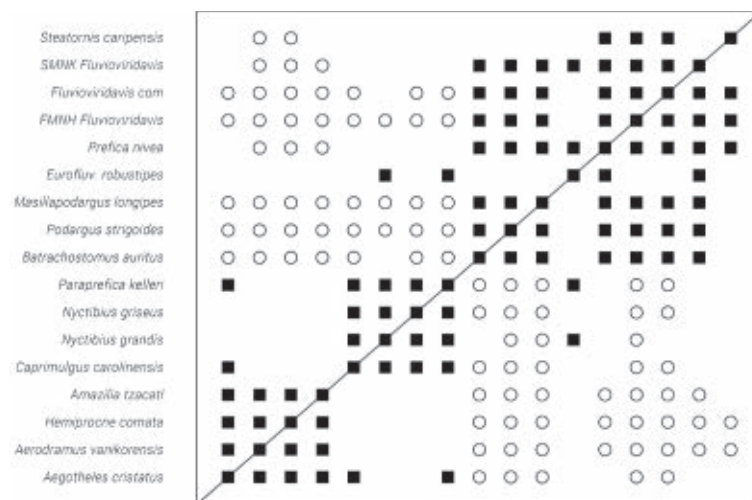
Table 4. Classification of 10 species according to the Whole Genome K-mer Signature method

Species	Cluster
<i>Gallus domesticus</i>	1
<i>Calypte anna</i>	2
<i>Chaetura pelagica</i>	2
<i>Athene cunicularius</i>	3
<i>Bubo blakistoni</i>	3
<i>Strix occidentalis caurina</i>	3
<i>Accipiter nisus</i>	4
<i>Aquila chrysaetos</i>	4
<i>Haliaeetus leucocephalus</i>	4
<i>Antrastomus carolinensis</i>	5

Table 5. Baramins predicted by the k-means algorithm from the WGKS analysis

Baramin	Species	Mean	Stdev	Min	Max	P-value	Neglog
3	3	0.993	0.003	0.991	0.996	0.0008	3.093
4	3	0.998	0.001	0.997	0.998	2.65E-07	6.577

a character relevance cutoff of 0.75. Figure 8 depicts the baraminic distance correlation (BDC) matrix. Black squares denote continuity between two species, and white circles represent discontinuity between a pair of species. According to the stress graph (figure 9), there is a minimal stress value of 0.142 at four dimensions. These groups are described in the following.

**Figure 8.** BDC matrix representing baraminic relationships between 21 species from the Nesbitt, 2011²⁰ study. Black squares represent continuity between two species, whereas white circles represent discontinuity.

The first putative baramin is made up of four species: three apodiforms, *Amazilia tzacatl*, *Hemiprocne comata*, and *Aerodramus vanikorensis*, and the owl-nightjar *Aegotheles cristatus*. These four species show continuity with one another, and show discontinuity between the third, fourth and fifth groups (especially the third group), but not with the second group.

The second putative baramin is made up of four species: *Nyctibius grisues*, *Nyctibius grandis*, the unclassified species *Caprimulgus carolinensis*, and the fossil species *Paraprefica kelleri*. These species show continuity with one another, but discontinuity only with the third group.

The third putative baramin is made up of three species from the family Podargidae, namely *Batrachostomus auratus*, *Podargus strigoides*, and *Mesitapodargus longipes*, as well as three species from the genus *Fluvioviridavis*. These species are continuous with one another, but discontinuous with the first and second group.

The fourth putative baramin is made up of six species from Steatornithidae, *Eurofluvioviridavis undulates*, the fossil species *Prefica nivea* (Steatornithidae), three species of Fluvioviridavis, and *Steatornis caripensis*. These six species show discontinuity with the first two groups, but interestingly, they show continuity with members of the third group. Therefore it is likely that we can consolidate groups three and four into a single baramin.

Figure 10 shows the MDS graph for 17 species in this study. There are two groups which separate well enough from all of the other groups: Apodiformes in medium grey (swifts+hummingbirds, including *A. cristatus*) and Nyctibiidae in light grey (potoos). Podargidae (frogmouths, dark grey) and Steatornithidae (oilbirds, dark grey) cluster together and seemingly form a single group.

Discussion

The main issue of this study is to find the true baraminic status of species from the order Caprimulgiformes. Whereas multiple lines of evidence were used to perform the most thorough analysis as possible, many species simply lacked sufficient data to be included. Based on evidence from mitochondrial DNA, whole proteome content comparisons, and Whole Genome K-mer Signature comparisons,

at least some of these species might be closer to Strigiformes than they are to Apodiformes, and vice-versa.

There are 220–225 extant species of owls, which belong to two families, Strigidae and Tytonidae. Several fossil owl families have also been discovered, which differ somewhat from extant owls. The phylogenetic trees based on the *cytb* and the *RAG-1* genes suggest there are at least two baramins corresponding to the two owl families.²³ Of the 13 Strigiformes species in this study, *Phodilus badius* belongs to the family Tytonidae, which is separated from all the other 12 species, which belong to Strigidae. It could be possible that before the Flood, there were several kinds of owls, with a larger diversity of species than what we have today. As such it might be possible that some species of Caprimulgiformes also belonged to this diversity of owl species, even though they are somewhat different in morphology to owls. It might be that certain parts of the potentiality region (the multidimensional morphospace which defines the position of all possible species within a given baramin) between Strigiformes and certain Caprimulgiformes went extinct during the Flood. For example, whereas frogmouths (Podargidae) are restricted today to Australasia, they had a much wider geographical distribution in the past.²²

The owl species all separated fairly well from the accipitriform species. Based on mitochondrial results, the families Cathartidae and Sagittaridae also separate from all of the other accipitriforms, therefore it is likely that they form their own baramins. Based on their own mtDNA studies, Jiang *et al.*²⁴ found that these two groups do not belong to Accipitridae. The mitochondrial DNA results showed that two species from the genus *Butastur* form their own cluster. However, these two species show the highest similarity to *Haliaeetus albicilla* and *Milvus migrans*, meaning that they may belong to the Accipitridae holobaramin.

Several studies indicate that Caprimulgiformes form a polybaramin, meaning that this taxon is not monophyletic. Such studies include genetic analyses on the gene *cytb*.^{10,25} Therefore, it may be possible that some caprimulgiforms belong to an owl baramin, others belong to an apodiform baramin, and others may form their own baramins.

In the family Caprimulgidae, the species *A. carolinensis* (also known as *Caprimulgus carolinensis*, or the Chuck-Will's-Widow) clusters with Strigiformes based on the GCM results. However, based on the WGKS method, it clusters by itself. Based on the morphological analysis, it clusters with Nyctibiidae (potoos). It may be that this single genus (*Caprimulgus*) does not have any special characters which would warrant it being treated as a separate genus.²⁶ The other Caprimulgidae species, *Caprimulgus indicus*, clusters well with Strigiformes based on the mtDNA study. Since genomics data is stronger evidence than morphology, this may suggest that Caprimulgidae belongs to an owl baramin, probably Tytonidae.

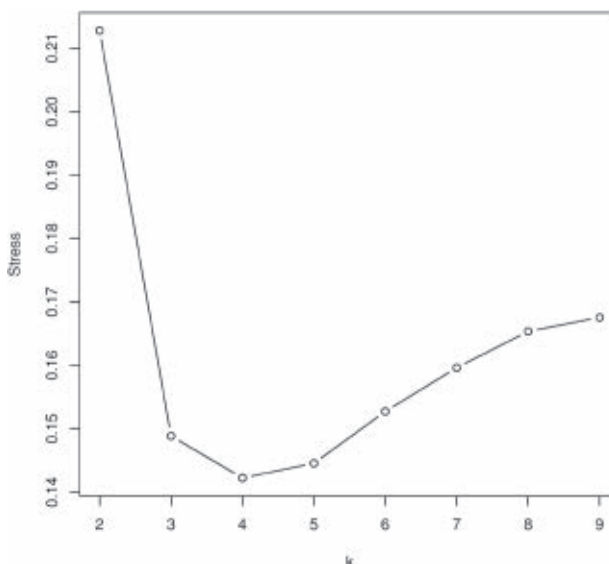


Figure 9. Stress graph showing a minimal stress at four dimensions for the Nesbitt 2011²⁰ data set.

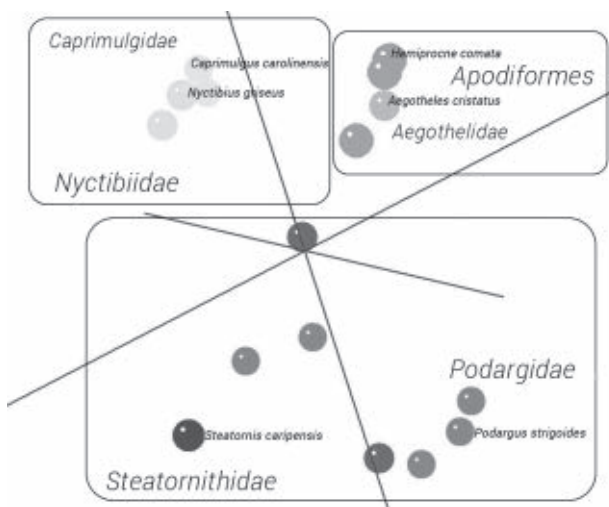


Figure 10. Three-dimensional MDS graph showing the relationships between the 17 species from the Nesbitt 2011²⁰ study. Three groups are depicted based on the BDC results. The colouring scheme is as follows: light grey, Nyctibiidae; medium grey, Apodiformes; and dark grey, Steatornithidae+Podargidae.

Species from Aegothelidae are not well studied and there is not much data about them. Sibley and Monroe placed this family as well as all caprimulgiforms into the order Strigiformes based on DNA-DNA hybridization studies.²⁷ Lightner puts them into their own baramin.¹⁸ Based on molecular and morphological similarities, some researchers place these species into the order Apodiformes.^{28,29} This study also shows similar results, clustering *A. cristatus* with three apodiform species, *Apus apus*, *Chaetura pelagica*, and *Cypseloides fumigatus* based on mitochondrial DNA similarity results. The BDIST analysis also shows similar results.

For 12 potoo, frogmouth, and oilbird species, only morphological data were available. These results suggest that frogmouths and oilbirds cluster together to form their own baramin, away from apodiforms. As mentioned earlier, potoos cluster with *A. carolinensis*. Nyctibiidae is not continuous with apodiforms, but neither is it discontinuous with it.

A study by Iwaniuk *et al.* describes the difference in cerebellum morphology of the five caprimulgiform families.³⁰ This is important, because brain anatomy reflects differences in behaviour and ecology. According to this study, apodiforms, nightjars, owl-nightjars, and potoos have relatively small anterior lobes and large posterior lobes, which is the opposite of owls, frogmouths, and oilbirds. Folia I-III of the cerebellum in apodiforms is reduced, whereas these folia are fully formed in owls. Owls have a folia Va and Vb, whereas apodiforms have a single folia V.

Conclusion

In conclusion, we can answer Emerling's questions in the following way: the order Caprimulgiformes is not monophyletic, nor a holobaramin (being above the level of family). Rather it is a polybaramin, containing species from five families, belonging to two or more holobaramins. It is possible that some of these species belong to Apodiformes, and some to Strigiformes, and yet others belong to their own separate baramin. Results from the BDIST study on the morphological data from Nesbitt *et al.* seem to indicate that some caprimulgiforms are morphologically more similar to Apodiformes than to Strigiformes. Therefore, any kind of morphological similarity between them and Strigiformes may be due to superficial similarities as exist between dolphins, sharks, and ichthyosaurs.

These results are summarized in table 6. Based on genetic and morphological similarities, Aegothelidae belongs to Apodiformes. Based on DNA similarity, Caprimulgidae likely belongs to Strigiformes. However, based on morphological

studies, it is continuous with Nyctibiidae. Even though Nyctibiidae does not show continuity with Apodiformes, it still is not discontinuous with it. Podargidae and Steatornithidae both cluster together and are discontinuous with Apodiformes. This means they either form their own baramin or could possibly still cluster with owl baramins. Further studies based on genetic comparisons would be useful.

Further study is needed to clarify the relationships between these groups. More complete data sets, including complete proteomes and whole genome sequences, would be needed for more Caprimulgiformes species.

Materials and Methods

Mitochondrial DNA study

The whole mitochondrial genome sequence for 57 species of Accipitriformes, Apodiformes, Caprimulgiformes, and Strigiformes, plus *Gallus gallus*, were downloaded from the NCBI website at ncbi.nlm.nih.gov/genome/browse#!/organelles/. After correcting sequencing errors, these sequences were submitted to Clustal Omega at ebi.ac.uk/Tools/msa/clustalo/.

Whole proteome and Whole Genome K-mer Signature analyses

The JaccardClusters.R script was used to run in Linux the Gene Content Method, which is available at github.com/csmaty/JCV. Whole proteomes were downloaded from the Uniprot website at uniprot.org/. The proteomes were uploaded to the EuPath Galaxy Site at eupathdb.globusgenomics.org/. The k-means clustering algorithm, the BT plot³¹, the heatmap, and the beeswarm plot were generated for both the whole proteome analysis and the Whole Genome K-mer Signature analysis using the k-means clustering R

script available at github.com/csmaty/kmeansClustering. The Python script `motif-analysis.py` was used for the Whole Genome K-mer Signature analysis, available at github.com/csmaty/motif_analysis. All of the supplemental data files and figures are available on github at github.com/csmaty/caprimulgiformes.

Morphological analysis

The BDIST software was used for the morphology study at coresci.org/bdist.html.^{32,33} A character relevance cutoff value of 0.75 was

Table 6. Classification of the five different caprimulgids in this study

Family	Biblical	DNA/protein	Morphology
Aegothelidae	-	Similar to Apodiformes	Similar to Apodiformes
Caprimulgidae	Similar to Strigiformes	Similar to Strigiformes	Continuous with Nyctibiidae
Nyctibiidae	-	-	No continuity/discontinuity with Apodiformes
Podargidae	-	-	Continuous with Steatornithidae, discontinuous with Nyctibiidae and Apodiformes
Steatornithidae	-	-	Continuous with Podargidae, discontinuous with Nyctibiidae and Apodiformes

used. *Quercypodargus olsoni* was excluded because it had no overlapping characters with *Masillapodargus longipes*. Four species were excluded since they belonged neither to Apodiformes nor to Caprimulgiformes. These species are *Crypturellus undulates*, *Eurypyga helias*, *Leptosomus discolor*, and *Trogon massena*. This species had values for only four characters. Results for the baraminic distance correlation graph were retrieved and are available in Supplementary Data File #4.

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- A beeswarm plot represents similarity values along a vertical axis. If there are a lot of values clustering around the same value, they are placed outwards, thus making the plot resemble a swarm of bees. The ECDF plot depicts the percentage of values on the y-axis that are less than or equal to a specific value on the x-axis. The greater the x value is, the greater the percentage of individual values less than that specific x value.
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Flood impacts reinforce volcanic cooling to start the Ice Age

Michael J. Oard

Some creation scientists believe that the Ice Age started several hundred years after the Flood. This would have allowed time for the complete deposition of the Cenozoic to occur after the Flood. Climate models with a warm ocean show that winters would be too warm after the Flood for the Ice Age. But computer models of snow cover, barren land, and an ash-covered surface are not sophisticated enough to model the Ice Age. Other variables could counteract the heating from the warm ocean and start the Ice Age in favourable areas immediately after the Flood. A huge amount of volcanic aerosols would help initiate the cooling. Atmospheric aerosols would be strongly reinforced by the climate effects of impacts during the Flood. The Chicxulub impact may have caused global temperatures to drop greater than 26°C for 3–15 years, with residual effects lasting up to 30 years. These powerful Flood impacts and late Flood volcanism, reinforced by copious post-Flood volcanism, also support a late Cenozoic placement of the Flood/post-Flood boundary.

There is a controversy among creation scientists as to when the post-Flood Ice Age began. Some believe it did not begin for several hundred years after the Flood because they place the Flood/post-Flood boundary at the Cretaceous/Paleogene (K/Pg) boundary of the geological column.^{1–4} Other creation scientists, myself included,^{5–9} believe the boundary is in the late Cenozoic for numerous reasons.¹⁰

At first, it may seem that those who put the boundary in the late Cenozoic would place it at or near the Pliocene/Pleistocene boundary, assuming the secular geological column.¹¹ After all, it is widely believed that the Pleistocene or Quaternary represents the time of the Ice Age.¹² However, many Pleistocene strata have nothing to do with the Ice Age, and the Pliocene/Pleistocene boundary cannot be considered a ‘precise’ placement for the Flood/post-Flood boundary. Rather, it can be anywhere in the late Cenozoic—the Miocene, Pliocene, or Quaternary—depending on the geographical location. In most of the regions that I have examined, the most likely placement of the Flood/post-Flood boundary is in the early Quaternary.^{13,14}

Moreover, secular scientists sometimes change their boundary dates based on new information. For instance, the lower portion of the Pliocene Beaufort Formation on north-west Banks Island was ‘redated’ 10 million years older to the mid Miocene and given the name Ballast Brook Formation because the scientists discovered very warm climate fossils in the strata—warmer than inferred for the Pliocene.^{15,16} Scientists not only date rocks by fossils, but also according to the *inferred Cenozoic temperature* based on the fossils, like they did for the Ballast Brook Formation.

Ice Age computer model suggests Ice Age could have been delayed

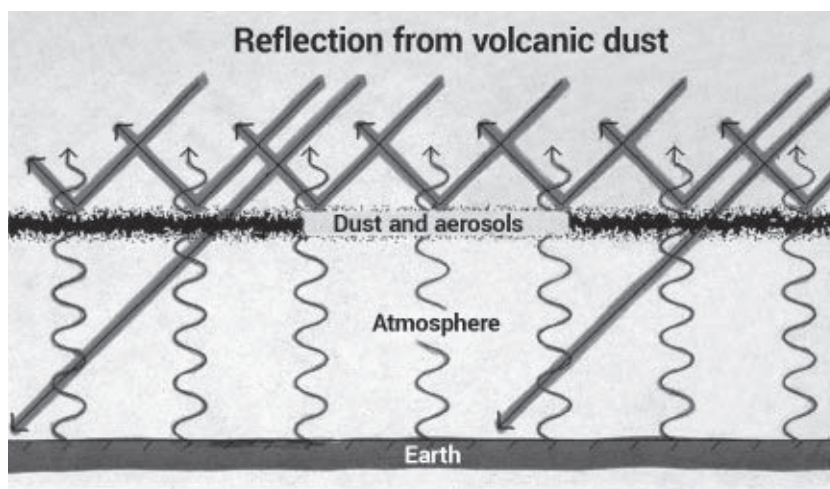
A delay in the Ice Age could be deduced from a recent computer model run, using the Goddard Institute of Space

Studies (GISS) climate model—first with an initial, average ocean temperature of 30°C immediately after the Flood,^{17,18} and second, with an average ocean temperature of 24°C.¹⁹ Dr Steven Gollmer from Cedarville University discovered that the warm oceans would prohibit the formation of ice sheets unless the high-latitude oceans cooled enough and/or the amount of aerosols (particles of around 1 µm in diameter) in the atmosphere was very high. The warm oceans would heat the lower atmosphere and, with strong evaporation, the condensation in the atmosphere would add huge amounts of latent heat. The model runs, indeed, showed that the warm ocean is a powerful source for atmospheric heat—more than I previously thought.

However, climate models are *simplifications* of the actual climate. Many complex processes in the atmosphere, biosphere, cryosphere, and oceans need to be modelled correctly, and the differences between the present and post-Flood climate must be accounted for. Often interactions between variables, which are sometimes non-linear, need to be accurately parameterized. Although the climate models are becoming more robust with time, they still have problems with clouds, solar and infrared radiation, ocean effects, surface albedo (especially snow), etc. Gollmer also ran his computer model out to only six model years, which probably is not enough time for the climate model to reach ‘equilibrium’. In modelling, it usually takes many years to reach equilibrium from a perturbation. Regardless, if Gollmer’s model is close to equilibrium with such warm ocean temperatures, it could probably mean that the Ice Age would be slower to develop in many areas, especially areas bathed by onshore flow of warm, moist air, heated and moistened by contact with the warm ocean. The model also shows that more precipitation likely fell over the oceans than I had estimated in the 1980s,¹⁸ but the precipitation pattern is sensitive to many other variables that need to be first modelled accurately.

Table 1. Albedos over various surfaces^{20–22}

Surface	Albedo (% reflected)
Planet as a whole	~30
Sand	18 to 28
Grass	16 to 20
Forests	14 to 20
Dense forests	5 to 10
Fresh snow	75 to 95
Old snow	40 to 70
Debris-rich ice	6 to 30
Debris-rich firm snow	15 to 40
Clean ice	30 to 46

**Figure 1.** Schematic of the reflection of some of the solar radiation off ash and especially aerosols

For example, snow cover will reflect more sunlight back to space than most other surfaces resulting in significantly cooler temperatures (table 1), but it depends on the characteristics of the snow surface. Snow albedo is particularly difficult to model because it changes on short as well as long timescales (table 1).

Another example is the amount and type of vegetation on land. I assume that most models assume the present distribution of land vegetation at the start of the Ice Age. However, after the Flood, the land would start out *barren* with vegetation growing in select locations, mainly at warmer low-to-mid latitudes. The high latitudes and much of the mid latitudes, though, were likely largely barren for several years after the Flood. Barren land has a higher albedo than vegetated land by about 10 to 20% (table 1), depending upon the density of the forest and the type of soil.²⁰

Moreover, extensive late and post-Flood volcanism would shroud large areas of the surface with light-coloured volcanic

ash that has a significantly higher albedo than barren ground—near that of snow, and could last decades.²³ This mechanism likely is very important for the development of the Ice Age, and photosynthesis would be little affected. Although aerosols will reflect much of the sunlight in the summer, a snow cover, barren land, and ash over some of the non-glaciated area would keep many continental areas below freezing in winter and strongly counteract summer heating. These variables may be crucial processes for modelling the Ice Age, but are difficult to model.

Volcanic eruptions cool

Gollmer's model runs show that the amount and distribution of the volcanic aerosols is a crucial variable for cooling the land during the Ice Age. The radiational and climatic effects of aerosols depend upon many variables, such as the intensity, latitude, the amount of SO₂ added to the stratosphere, and the height of injection.²⁴ The SO₂ mixes with water vapour and air in the atmosphere and becomes a sulfuric acid aerosol. Much water vapour, needed to combine with SO₂, is added to the stratosphere during volcanic eruptions. It is this aerosol that

produces the long-term cooling.²⁵ These variables are difficult to model accurately.

But we do know from historical observations that large volcanic eruptions cool the climate by reflecting some of the sunlight back to space (figure 1).^{9,26,27} Volcanic ash usually coagulates and falls to the ground within weeks to a few months.²⁸ Considering how fast temperatures cool at night with no solar radiation, thick volcanic ash could cause severe cooling for several weeks. However, the cooling effect of the atmospheric ash itself would be regional and short-term.

Volcanic aerosols usually fall out of the stratosphere in about 1–3 years and cool the climate in that time. For instance, the large eruption of Tambora in 1815 in Indonesia is believed by many scientists to be responsible for the 'year without a summer' in New England and adjacent Canada in 1816.²⁹ And, if the aerosol is injected into the upper stratosphere by especially strong volcanoes, the cooler temperatures can last about 10 years.³⁰

The Toba super-eruption on Sumatra occurred during the Ice Age and is believed to have produced over 50 times the stratospheric aerosols as Tambora. The temperature of the Northern Hemisphere is estimated to have cooled 3–5°C.³¹ Some researchers believe Toba produced even more cooling. Since the aerosol probably penetrated the upper atmosphere, the cooling would last more than the historical maximum of three years.³⁰

However, other processes occur in super-eruptions that likely make climatic cooling estimates exaggerated and uncertain. One example is the inability of SO₂ to combine with enough water vapour to form as much sulfuric acid as expected.³² Another is the coagulation of thick aerosols making them heavier and causing them to fall out of the atmosphere faster.³³

Flood volcanic aerosols

The volcanic aerosols right after the Flood would be thick because of numerous Plinian eruptions that would have occurred in the Flood. The Plinian eruptions would have penetrated up through the surface and spread ash and aerosols far and wide, as reflected in the numerous ash beds in Mesozoic and Cenozoic sedimentary rocks. The numerous huge basaltic eruptions that formed large igneous provinces (LIPs)³⁴ are considered by uniformitarian scientists to have seeded the stratosphere with a huge amount of sulfuric acid aerosols during fire fountaining during eruption.³⁵ However, these eruptions should *not* produce much sulfuric acid aerosols in the Flood model with a boundary in the late Cenozoic because the LIPs erupted mostly underwater not on land as uniformitarian scientists assume.

Assuming the Cenozoic was late in the Flood (see below), numerous Plinian eruptions have been deduced. For instance, the thick, widespread Cenozoic sedimentary rocks along the northern and central High Plains of the United States represent about 60–80% volcanic ash, reworked by water.^{36,37} Several famous badlands have subsequently developed from erosion of the top of these sediments (figure 2). It is surmised that the volcanic eruptions occurred in southern Nevada.

For over 30 years, I was unsure of when, in relation to the Flood, the most recent Yellowstone super-eruptions occurred,



Figure 2. Badlands in Badlands National Park, South Dakota, USA



Figure 3. Lava Creek B ash layer from the last Yellowstone Park super-eruption within the pediment gravel within a pediment remnant in the upper Wind River Basin, Wyoming, USA (Hans and Lisa Reinhardt for scale)

which are dated as Quaternary by secular scientists.³⁸ Were they late Flood, post-Flood, or both? From a research project just south-east of Yellowstone Park in the upper Wind River Basin, I noticed volcanic ash from the last super-eruption within the pediment gravel (figure 3).¹⁴ Since pediments are a product of Flood runoff,^{39,40} the Yellowstone super-eruptions were most likely *late Flood*.

Such late Flood activity is also deducible from the post-Flood history of the Yellowstone area, which developed an ice cap up to 1,000 m thick.⁴¹ How could super-eruptions occur when so much ice was piling onto the Yellowstone area? If the eruptions occurred during the Ice Age, there would have been huge flooding and mass flows down the adjacent valleys, which is not observed. The Yellowstone super-eruptions have profound effects for dating sediments and sedimentary rocks in the western two-thirds of the United States, in that secular scientists use the dated ashes to correlate by tephrochronology.¹³

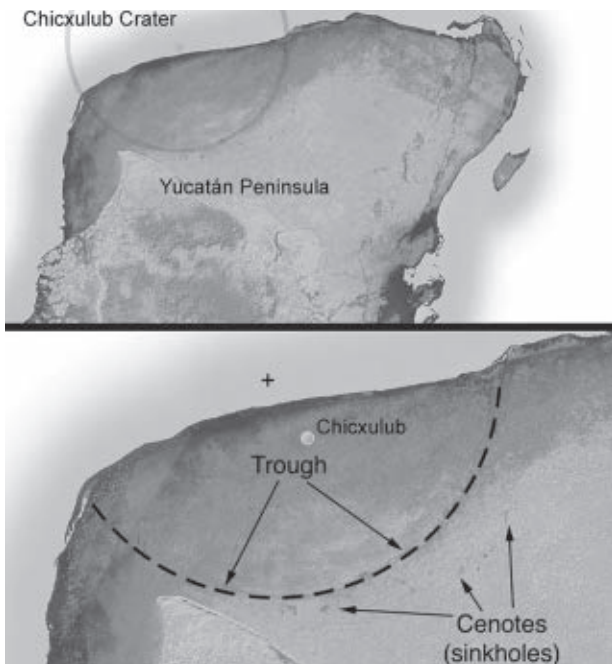


Figure 4. Shaded relief map of Mexico's Yucatán Peninsula showing estimated location and diameter of the Chicxulub impact. Numerous sinkholes cluster around the southern boundary of the impact structure (NASA, modified by David Fuchs, Wikipedia Commons).



Figure 5. Artistic rendition of the Chicxulub impactor striking ancient Earth (Donald E. Davis, Wikipedia Commons PD NASA)



Figure 6. Shatter cone developed in fine-grained limestone from the Charlevoix crater, Québec, Canada, Collection of the Observatoire de l'Astrolème de Charlevoix (JMGastonguay, Wikipedia Commons CC-BY-SA-4.0)

Another large Cenozoic igneous province is an ignimbrite province that extends over a large portion of the Sierra Madre Occidental of north-west Mexico.⁴² Much of this mid Cenozoic ignimbrite supposedly erupted into the air. The eruptions were huge and widespread and would have seeded the stratosphere and the troposphere, with abundant SO₂ causing volcanic winter after the Flood.

Great cooling inferred from the Chicxulub impact

Volcanic cooling would be reinforced by meteorite or comet impacts that would cool the climate from the debris and aerosols thrown into the atmosphere and beyond. The 'very late Cretaceous' Chicxulub impact on the northern coast of the Yucatán Peninsula of southern Mexico is dated at the K/Pg boundary (figure 4) and thought by many secular scientists to have killed off the dinosaurs and many other organisms. The number of Flood impacts as well as their effects are still debated among creation scientists. The Chicxulub impact may have been relatively large and resulted in a multiple-ringed crater with the outer ring about 180–200 km (113–125 mi).^{43,44} The impactor was estimated to be about 10 km in diameter (figure 5) and is considered the best representation of an impact crater on Earth. Dr Tim Clarey of the Institute for Creation Research is skeptical of the claimed large size of the Chicxulub impact because it lacks some major impact diagnostic signatures, such as it is missing an iridium anomaly and had a low amount of melted rocks and broken up rock.⁴⁵ However, it still had a fairly circular gravity anomaly with a claimed peak ring and a possible annular low, up to several hundred metres of suevite,⁴⁶ shocked quartz, coesite,⁴⁷ a little pseudotachylyte,⁴⁸ a small amount of melt, and a few shattercones (figure 6).^{49,50} There was 130 m of suevite encountered in a new drill hole into the claimed peak ring structure.⁵¹ Clarey makes a case that most of these diagnostic features can be formed by other mechanisms. However, when all together in one place, I believe that it was a true Flood impact.

However, neither the Chicxulub crater nor the approximately 200 other secular recognized craters on Earth are ideal examples because Flood processes would likely have modified them. Two other large impacts, the Precambrian Sudbury and Vredefort impacts, have been greatly modified by tectonics and erosion.⁵¹ Impact craters would be subject to subsequent faulting, isostatic rebound or subsidence, erosion, and sedimentation. Because of the Flood, no earlier impact will be pristine, and the evidence for most of them would be destroyed or mostly destroyed. I believe there were many more than 200 impacts during the Flood, possibly in the thousands, but not the number that Spencer and I had earlier calculated using the Moon as an analogue.^{52,53}



Figure 7. Postulated area of snow and ice after 50 years in the Northern Hemisphere including high mountains (drawn by Melanie Richard)



Figure 8. Postulated area of snow and ice after 100 years in the Northern Hemisphere including the mountains (drawn by Melanie Richard)

Recent research on the Chicxulub impact has shown that it likely ejected more aerosols into the stratosphere, resulting in greater global cooling, than previously thought.⁵⁴ A large impact will blast particles up into the stratosphere, which can cause global cooling. However, the amount of cooling will depend upon several variables, such as the target rock and how much SO_2 and CO_2 enters the stratosphere. Mid- and high-latitude eruptions and impacts would tend to spread the aerosols mainly within that hemisphere, while large tropical eruptions and impacts will eventually spread their aerosols over the whole globe in a matter of a few months. The added CO_2 will cause warmer temperatures. But this occurs mainly after most of the sulfuric acid falls out of the atmosphere, and

it depends on the carbon dioxide sensitivity with temperature, or in other words the temperature change caused by a certain increase or decrease in CO_2 .

Researchers did not know how much SO_2 would enter the atmosphere from the Chicxulub impact, since the target rocks had both carbonates and ‘evaporites’, some of which are sulfur-rich anhydrite (CaSO_4). But with more drilling offshore of the Yucatán Peninsula, it was discovered that the Chicxulub impact may have disintegrated more evaporites than expected, causing more SO_2 to enter the stratosphere.⁵⁴ It also may have added less CO_2 than previously thought. The global temperature drop is thus now believed to have been greater than the older estimate of a 26°C drop for 3–15

years with residual effects to 30 years.⁵⁵ Although this was a Flood impact, the cooling would extend well after the Flood. This effect is potentially much greater than those from large volcanic eruptions like Tambora and even Toba. Much more dramatic cooling results because impact aerosols reach up into the mid and upper stratosphere, while volcanic aerosols usually reach only the lower stratosphere.⁵⁶ The climate effect depends upon the stratospheric residence time of the aerosols. Such intense volcanic and impact cooling right after the Flood may inhibit photosynthesis in many areas.

Therefore, after the Flood a huge amount of volcanic and impact aerosols would be in the stratosphere causing a cool climate over the continents. This justifies the use of the high aerosol content in Gollmer's model runs. This huge amount of aerosols, plus the high albedo of much of the mid- and high-latitude continental surfaces, would likely be enough to trigger the Ice Age in favourable areas.

The Ice Age starts slowly in favourable areas

The combination of 'volcanic winter' and 'impact winter' likely resulted in substantial global cooling on the continents for a few decades *immediately* after the Flood. The oceans would be little affected because of the high heat capacity of water. The Ice Age then would have progressed from the favourable areas after a few decades to reach a maximum with copious post-Flood volcanism, a little cooler mid- and high-latitude sea surface temperatures, and established areas of snow cover resulting in a high albedo.

Because of the modifying effects of the warm ocean, the Ice Age would develop in favourable areas *first*. There would not be a delay of a few hundred years, except in areas especially influenced by onshore flow of warm, moist air. One favourable area would be in high- and mid-latitude continental areas far from the onshore flow. Central Canada would be most favourable (figure 7). Eastern Canada and north-east Europe would not be far behind (figure 8). High mountains at high latitudes would also be favoured for the rapid development of ice caps, since the temperature would cool with altitude.

Climate would still not be warm even if the Ice Age were delayed

With volcanic and impact winter occurring on land, and regardless of the temperature effect of the warm ocean as modelled by Gollmer, the high latitudes and mid-continental areas at mid latitudes would not have subtropical-to-tropical temperatures, as demanded by Cenozoic fossils.⁹ So, I conclude that most of the Cenozoic is most likely *not* post-Flood, just on the above two criteria. And it fits with my

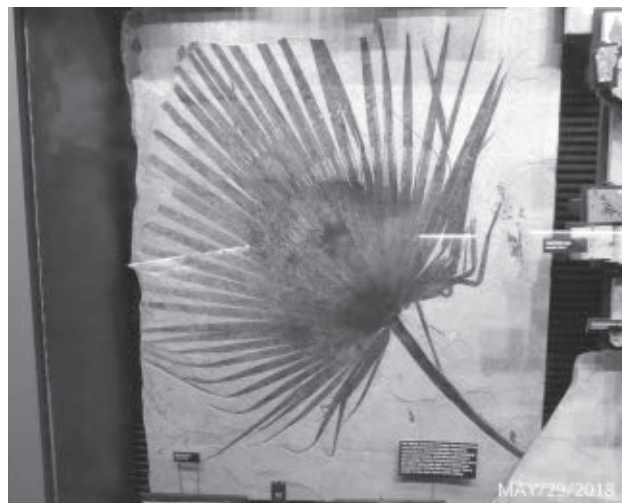


Figure 9. Palm fossil found in the Green River Formation, south-west Wyoming, USA, at over 2,000 m asl

earlier conclusions based on 30 other criteria that I have developed.⁵⁷

For instance, mild climate plant fossils and pollen are found from sedimentary rocks in central Siberia.^{58,59} In lower Cenozoic strata in southern England, palms and mangroves are among the tropical fossils found.⁶⁰ Palms and swamp cypress are found in sedimentary rocks on the island of Spitsbergen in the Svalbard archipelago, north of Norway at about 80°N.⁶¹ Petrified palm fruits have been discovered in north-western Greenland.⁶² Tropical and subtropical plant and animal fossils, such as palms (figure 9) and crocodiles (figure 10), are found in the Eocene Green River Formation (GRF) in the central Rocky Mountains.⁶³ The GRF is far from the ocean and straddles the continental divide near 2,400 m altitude in south-west Wyoming. It contains early Cenozoic crocodiles, large tortoises that cannot hibernate, tree ferns, and palm fossils. These warm climate fossils are found not only in Wyoming, but are also found farther north in Montana.^{64,65,66} Palms, swamp cypress, mangroves, climbing vines, and other plants that would be found today in a warm, if not tropical, climate are abundant in the Cenozoic of Alaska.⁶⁷ All these fossils are greatly out of place for the climate and conditions there now, and even in the climate that prevailed in the centuries immediately after the Flood.

Conclusions

A previous climate model run with a warm ocean shows that the continents may be too warm for ice sheets to start growing right after the Flood, even with significant volcanic loading of the stratosphere. This would suggest that the Ice Age was delayed, possibly supporting the views of those who advocate that the Cenozoic was warm and post-Flood. However, climate models are simplifications of nature and



Figure 10. Crocodile fossil found in the Green River Formation, south-west Wyoming, USA, at over 2,000 m asl

do not parameterize many atmospheric processes well. This paper has identified several likely processes that would be a positive reinforcement for the early development of the Ice Age in some areas: (1) an accurate snow aging effect; (2) the higher albedo of barren land; and (3) the higher albedo of land covered with volcanic ash.

Large, andesitic volcanic eruptions are known to cool the earth. Volcanism and extraterrestrial impacts together would have likely been immense during the late Flood, and stratospheric aerosols would kick-start the development of ice sheets. Just the late Flood Chicxulub impact, itself, could have cooled the global climate by over 26°C for three to 15 years with residual effects to 30 years. This would start the Ice Age right after the Flood in selected locations. Regardless of the effects of the warm ocean, one thing is for sure for the scenario that the Cenozoic is post-Flood: the early post-Flood climate would have been too cold to account for the consequent Cenozoic ‘history’.

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47. Coesite is a high-pressure form of quartz.
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The Florissant redwood trees deposited from a Flood log mat

Michael J. Oard

There are numerous vertical, petrified trees found in sedimentary rocks around the world. The vertical, petrified redwood stumps at Florissant Fossil Beds National Monument are a famous example. They have several unusual features that are problematic for an *in situ* interpretation. In the Florissant Formation, 1,500 insect and spider species fossils and about 260 plant species and pollen have been found. They come from widely diverse environments, yet they are buried together. There is no modern analogue. Some of the fossil species are found alive in subtropical and tropical environments. Some are not native to North America but from distant parts of the globe. The hypothesis that well-preserved fossils are from preservation by biofilms has contradictions. The paleoaltitude is thought to be near the same as it is today, about 2,490 m, but with an anomalous mean annual temperature that was much warmer with very little frost. There are numerous contradictions to the uniformitarian hypothesis. The evidence supports deposition of the organisms, including the vertical redwood stumps, from floating log mats during the Genesis Flood.

Although creation scientists have reasonable answers for many earth-science challenges,¹ many still exist that need adequate answers. One of these challenges is upright petrified trees in sedimentary rocks,² which uniformitarian scientists almost always assume grew *in situ*.

Geological basis for the log-mat model for the Flood

From an estimate of the amount of coal in sedimentary rocks, it can be deduced that the amount of carbon in the pre-Flood terrestrial biosphere was 10 times the present-day biosphere.³ As a result of the Flood, creation scientists have recognized that many of these trees and vegetation would end up in huge mats of logs and vegetation floating for a while on the floodwater.⁴⁻⁶ These floating mats would have served as a temporary home to all kinds of creatures attempting to survive a global Flood in which the land was rapidly disappearing. The logs that floated on Spirit Lake north of Mount St Helens after the 1980 eruption provide an analogue, although imperfect because terrestrial organisms had no need to briefly inhabit those logs. Many of the floating logs on Spirit Lake have sunk vertically.

The Flood log mats provide reasonable answers to five challenges to the Flood model in sedimentary rocks: polystrate trees, including the Yellowstone fossil ‘forests’; paleoflora, including high-latitude warm types; insect fossils; amber, sometimes containing insects and other organisms; and coal seams.⁹ Many of these logs would have continued to float on the oceans after the Flood and may explain numerous biogeographic mysteries,⁷⁻¹¹ such as how New World Monkeys of Central and South America made it across the Atlantic Ocean after the Flood.¹²

Numerous locations with upright petrified trees

I have written about several of the many outcrops of vertical petrified trees in sedimentary rocks. These include those found in a coal mine about 7 km north of Sutton, Alaska, USA, which is 80 km north-east of Anchorage (figure 1).¹³ Petrified trees of Ginkgo Petrified Fossil Forest State Park in central Washington, USA, are orientated at various angles to the Columbia River Basalt flows and their interbeds, which are predominantly horizontal. The tops of these trees have been sheared off. Mummified stumps of warm-climate *Metasequoia* (dawn redwood) and *Glyptostrobus* (swamp cypress) stumps, 1 m high and up to 1 m in diameter at the base of the trunk, have been found on Axel Heiberg Island at 80°N in the Queen Elizabeth Islands of north-east Canada.^{14,15} Petrified stumps and trees are found at many other locations in the Queen Elizabeth Islands. These are dated Paleogene, the early Cenozoic. The so-called fossil forest of Theodore Roosevelt National Park, North Dakota, USA, has hundreds of vertical stumps about 2 m tall that flare at the base. The trunk is not only sheared off, but the trees also have no branches, roots, or soils (figure 2).¹⁶ They are found in the early Cenozoic Fort Union Formation.

The Yellowstone ‘fossil forests’ are probably the best example of vertical petrified trees that are considered *in situ* and hence seen as a challenge to Flood geology.¹⁷ Uniformitarian scientists have counted up to 75 levels of vertical trees at Specimen Creek that supposedly represent 100,000 years.¹⁸ But there are a number of contradictions to the uniformitarian story, such as no soils, and often no roots (figure 3), which suggests deposition from log mats during the Flood.¹⁹⁻²¹



Figure 1. Two polystrate trees, up to 4 m (13 ft) tall, from a coal mine north of Sutton, Alaska, USA. Notice that there are no roots, branches, or soils.



Figure 2. Portion of one layer of vertical petrified trees in the ‘fossil forest’ of Theodore Roosevelt National Park, south-west North Dakota, USA. Peter Klevberg pointing to the lack of roots and soil under the vertical tree stump.



Figure 3. Vertical tree with no roots in Absaroka Volcanics on Mount Hornaday, north-east Yellowstone Park, USA (David Anderson provides the scale)

All of these locations with vertical petrified trees display many contradictions to uniformitarianism. I have already pointed out problems with the idea of *in situ* vertical trees,⁹ such as trees and pollen from a wide variety of environments: from cool temperate to tropical. This is more supportive of what we would expect from a log mat during the Flood.

The Florissant redwood trees

The Florissant Fossil Beds National Monument is west of Pikes Peak at about 2,490 m (8,200 ft) asl in central Colorado and about 3.5 km (2 mi) south of the town of Florissant. The site displays large vertical stumps of redwood trees (*Sequoia affinis* or ancient redwood). Collectors took many of the petrified trees away before it became a national monument in 1969, but about 30 trees still remain (figure 4). A few are not redwoods.

The redwoods are very similar to the extant redwood tree (*Sequoia sempervirens*) that grows naturally only in the coastal areas of northern California and southern Oregon, USA, in which 40% of its water comes from warm season fog. These redwoods are the tallest trees in the world, up to over 100 m (330 ft) and 7 m (23 ft) in diameter. The largest trees are about 1,500 years old. Redwood trees have been planted in many different areas of the world and grow well if watered. Interestingly, redwood trees commonly sprout from the base of a stump or decaying tree, resulting in several trees growing from it, as observed in Redwoods National Park, California, USA (figure 5). They have much the same configuration as the three contiguous petrified stumps at Florissant (figure 6).

‘Big Stump’ measures 4 m (13 ft) in diameter (figure 4) and was around 750 years old when it died (figure 7). The Florissant redwoods have larger growth rings (figure 7) than those in northern California and southern Oregon, indicating that in the past the redwoods grew in a healthier environment of growth than today.²² Frost rings are considered rare. The environmental conditions indicated by the fossil tree rings contradict what would be expected at the elevation and latitude of Florissant.

The exhibits say the stumps were preserved because of a volcanic lahar from Guffey Volcano, 24 km (15 mi) to the south-west, that entombed the redwood trees in about 4.5 m (15 ft) of mud and volcanic tuff.²³ Groundwater then penetrated the tuffaceous mudstones, dissolving silica, SiO₂, which was taken up by the trees and filled the volume between the cell walls. Only the part of the tree entombed in the tuffaceous mudstones was permineralized, while the roots and the tree above the mudstone rotted away. Mustoe noted that the permineralization did not follow the typical pattern for the formation of petrified wood.²⁴ One problem with the lahar explanation is that the top of the lahar should have been

at the same overall height, so the tops of the stumps should also be the *same* height. However, the Big Stump is about 9 m (30 ft) higher than some of the others (figure 8). That is twice as high as the thickness of the supposed lahar.

'Lake Florissant'

The petrified redwoods are found within a small area of the deposits of 'Lake Florissant'. This lake is said to have been formed by the occasional damming of a south-flowing stream by lahars. The lake would have been about 1.5 km (1 mi) wide and about 20 km (12.5 mi) long in a valley within the 1.08-billion-year old (supposedly) Pikes Peak Granite that forms a dissected and rough erosion surface on the central Colorado Rockies at about 2,200–3,300 m (7,200–10,800 ft) (figure 9).^{25,26} Secular scientists refer to this surface as the 'Tertiary pediment' found at the base of the high Colorado Mountains and it is much dissected and roughened.²⁷

The sediments include a lower shale; a lower mudstone with 'stream' deposits and siltstone, where the petrified trees are found near the top; a middle shale; a conglomerate; an upper shale; and a pumice conglomerate (figure 10). These sedimentary rocks are now called the Florissant Formation and all together are 74 m (243 ft) thick. Paleozoic and Mesozoic strata are not preserved and so are claimed to have eroded away.

The shale (figure 11) formed from repeated microlayers of diatoms (light-coloured) and ash that is mostly transformed to clay (dark-coloured).²⁸ Each couplet is considered to be a 'varve', a repeating sedimentation pattern deposited in one year. The varves are only 0.1 to 1 mm thick, considered 'paper shales', which seems quite thin compared to those forming today. It is mainly in the shales where the delicate leaves, pollen, and insects are found. One problem with the varve interpretation is that there are articulated fish, which should not have been preserved in such thin 'varves'. Interestingly, a compressed opossum fossil was also found in the shales.²⁹ Many of the fossils are well preserved, but many are not. In one area 56% of insects are disarticulated and 66% were considered of low quality.³⁰

The exquisite detail of many of the fossils is claimed to have been preserved almost exclusively in a biofilm, shown by scanning electron micrographs and believed to have originated from the diatoms that grew due to the high silica content of the water.³¹ This is unusual in that the vast majority of biofilms are caused by bacteria.²¹ The diatoms are composed of 19 'freshwater' genera,²¹ but more than 85% are from one species.³² The most abundant types are similar to modern genera. It is unlikely that the biofilms were responsible for the fossilization since the insect remains in the mudstone and siltstone lack biofilms.²⁰ In one study section, 436 specimens were found in shale, 62 specimens in



Figure 4. The Big Stump from Florissant National Monument is 4 m (13 ft) in diameter.



Figure 5. Multiple redwood trees in a circle from Redwoods National Park, Northern California (my wife Beverly provides the scale)



Figure 6. Two of three petrified redwoods connected in a circle at Florissant National Monument

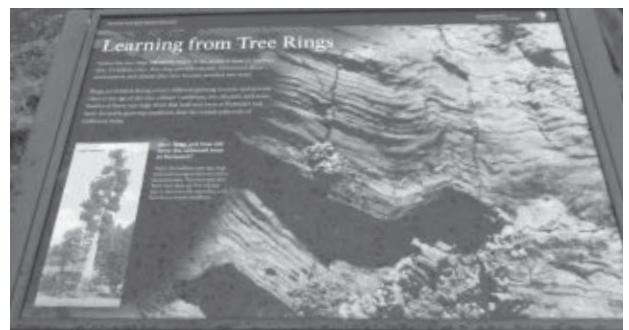


Figure 7. Kiosk at the Big Stump indicating it grew for 500 to 750 years.



Figure 8. The top of one stump in the foreground with the Big Stump in the background (arrow). The difference in the elevation of the top of these two trees is about 9 m (30 ft), which does not seem to represent the top of the ancient lahar.



Figure 9. Erosion surface (line) on front range of central Colorado Rocky Mountains, USA, at about 2,200–3,300 m (7,200–10,800 ft) taken from the top of Pikes Peak

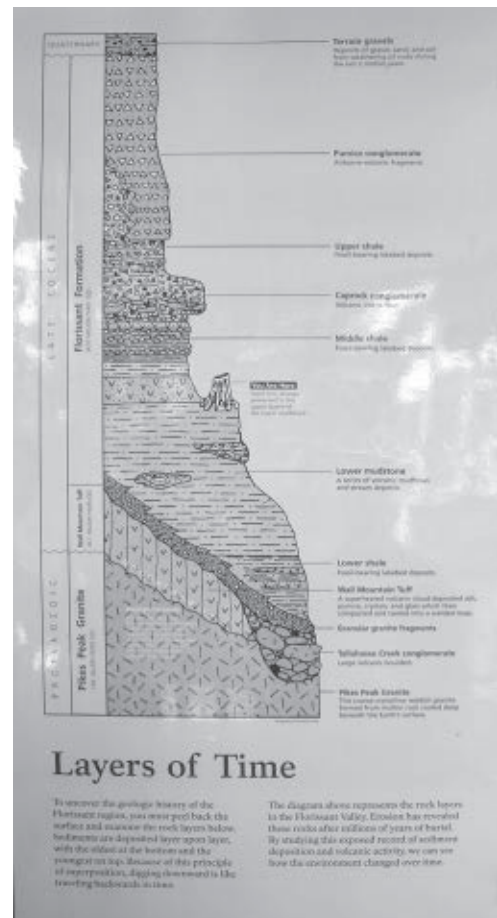


Figure 10. The stratigraphic column of the Florissant Formation from a kiosk at Florissant National Monument

mudstone, and 325 from siltstone.²⁰ Moreover, well-preserved fossils found at other sites, such as at Republic, north-east Washington, USA, and in the Green River Formation of Wyoming and Colorado, USA, do not have biofilms.²¹ Preservation by biofilms, therefore, seems unlikely.

The organisms in the Green River Formation, considered a post-Flood lake by some creation scientists,³³ provide many evidences that it was deposited in the Flood,^{34,35} including enough oil to supply the energy needs of the USA for 100 years. Just like with the Florissant site (see below), the fossils from the Green River Formation come from a wide range of climates and environments, such as terrestrial and marine environments.³⁶

The dates of the deposits were once controversial.³⁷ They have been dated by various investigators from Pliocene to Eocene. Based on the paleoflora, MacGinitie “demonstrated that the lacustrine deposits belong to the early Oligocene”.³⁸ But the dates of the Eocene/Oligocene boundary were changed, so that the Florissant Formation then automatically became very late Eocene about 34 to 35 million years in the early Cenozoic.

No modern analogue

The shales include macroflora and pollen from a wide variety of environments.¹³ The Florissant site is among one of the world’s richest fossil sites with over 50,000 museum specimens from fossils of over 1,800 species, of which 1,500 are insects and spiders and 260 plants.^{12,39} There have been taxonomy problems, especially in regard to the older works.^{29,40}

Some of the fossilized plants grow today in the southern Rocky Mountains. These include pine, fir, larch, spruce, oak, willow, hemlock, birch, poplar, rose, mountain mahogany, currant, and maple. Some of the plants found in the Florissant area indicate a cool temperate climate, such as spruce, larch, and birch. Others are found only in the eastern USA, such as hickory, redbay, elm, and linden. More are found in Mexico, such as xylonagra, *Conzattia*, and *Thouinia*. And most unusual, some genera come from eastern Asia and are not extant in North America at all, such as the golden-rain tree (figure 12), golden rubber tree, the tree of heaven, *Engelhardia*, *Dipteronia*, and *Eucominia*. The

golden-rain tree also is found today in Fiji.

The numerous insect fossils also indicate a very diverse environment. The most unusual insect fossils are those of the tsetse fly, which is found today only in central Africa. The only known fossils of this blood-sucking disease carrier are from the Florissant site (figure 13). The Florissant insects look basically similar to modern types, but because they are thought to be 34 million years old, taxonomists give them different names thinking they are extinct:

“Many people expect that the world would have looked drastically different 34 million years ago, but in reality, some organisms such as insects looked very similar to the way they look today.”⁴¹

Taxonomic renaming gives the impression that these ‘old’ organisms are significantly different, and that evolution has actually taken place. This is probably why the redwoods are given a different species name than modern redwoods.

Vertebrates are rare in the Florissant Formation.⁴² These include fish with whole skeletons including the bowfin, which reached a length of 45 cm (18 in); catfish; sucker; and perch.¹³ Rare fossils of birds including cuckoo, shorebirds, and ground rollers have been found. Ground rollers live today only in Africa.¹³ Only one fossil mammal was found in the shales—a mouse opossum, a marsupial whose closest living relative is from Mexico and South America.

With detailed collecting, other fossil mammals have been found, mostly in the mudstone, siltstone, and stream deposits. Most of these fossils are jaws and teeth. These include the brontothere, an extinct rhinoceros-like animal; an oreodont, an extinct animal somewhat resembling a pig; a small three-toed horse jaw attributed to *Mesohippus*; rabbits; various rodents; a shrew; a mole; and other unidentified bone fragments. There are also clams

Table 1. Seventeen criteria listed by Johns to interpret *in situ* trees

1	Monospecific trees
2	Non-random spacing
3	Non-overlapping roots
4	Roots that cross-cut bedding planes
5	Rapid burial and excellent preservation
6	Paucity of underlying sedimentary rocks
7	Little or no distortion of bedding layers below trunk
8	Mixture of vegetation
9	Lack of root truncation
10	Roots penetrate downward like a spider
11	Trees found in tidal laminations
12	Delicate roots penetrating laminated sediments
13	A more or less complete ecosystem
14	Widely spaced trees resembling modern tree spacing
15	Finding conifers and angiosperms on two or more levels of peat or coal
16	Boulders and cobbles in rooted zone with fine-grained sediments below
17	High height/stump width



Figure 11. Paper-thin shale from Florissant National Monument that contains abundant insect and plant fossils (arrow)

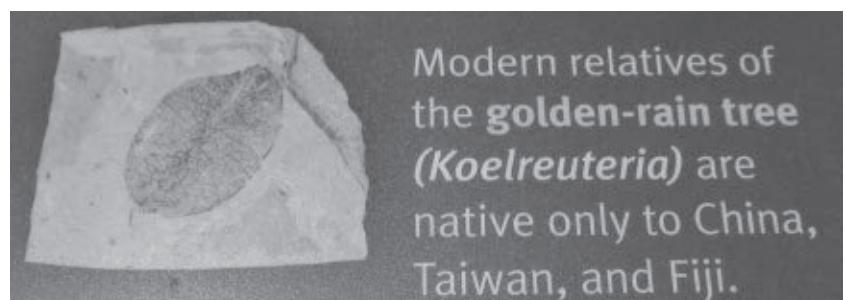


Figure 12. Kiosk of a golden-rain tree leaf fossil found at Florissant Fossil Beds National Monument



Figure 13. Kiosk about the tsetse fly fossil found at Florissant Fossil Beds National Monument and its modern distribution in equatorial Africa

and snails, but most mysteriously, reptiles or amphibians are missing.¹³ This is one more indication that these fossils beds were not from a natural environment.

High elevations and warm temperatures

Researchers have argued over the paleoelevation of the Florissant fossil site.⁴³ The paleoelevation estimates vary from 455–4,133 m (1,490–13,560 ft).⁴⁴ One problem is that the character of the fossils may reflect either altitude or climate change.⁴⁵ Zaborac-Reed and Leopold believe the altitude was 1–1.5 km (3,300–4,900 ft), while Meyer believes several methods converge on about the same altitude as today, 2,490 m (8,200 ft) asl,³⁴ which seems to be the current consensus.

Estimating the temperature and precipitation from the fossils is also fraught with problems. All methods have large errors with leaf physiognomy (mostly the shape of

the margin) producing cool temperatures while the nearest living relative method gives warm temperatures. Both paleoenvironmental deductions are likely true since the fossils represent a mixture of environments.⁴⁶ Many of the fossils indicate a subtropical climate. Some are even from the tropics.¹² A search was made for a modern analogue from 241 modern forest plots in North America, Central America, and South America.⁴⁷ No analogue was found, but three environments came close, which had moderately high mean annual temperature with seasonal precipitation. Meyer and Weber conclude:

“Nowhere in the modern world is the same association of plants and insects found living together. Among the fossils at Florissant, plants and insects that today are subtropical are juxtaposed beside others that are typically cool-temperate in modern distribution.”⁴⁸

Generally, mean annual temperatures are estimated between 13 to 18°C (55–65°F) with very little if any frost. This compares to the mean annual temperature today of 4°C (39°F), but temperatures can drop as low as -37°C (-35°F) in winter.¹³

Criteria for determining *in situ* trees

Johns has presented 17 criteria that can be used to decide whether vertical petrified trees are *in situ* or have been transported.² These represent an amalgamation of lists developed by Clarey and Tompkins⁴⁹ and Wise⁵⁰ with several additions. Johns also challenges some of the criteria produced by Clarey and Tompkins and Wise, and Wise challenges several of the criteria listed by Clarey and Tompkins. John’s criteria are presented in table 1. Many of these criteria cannot be evaluated at fossil ‘forest’ sites, mostly because of lack of exposure for inspection. Some can be challenged, such as monospecific trees, criterion 1. The Florissant trees are mostly monospecific. The numerous trees, probably on one bedding plane, in the Theodore Roosevelt National Park are monospecific, but they lack roots and soil and so are obviously from the Flood. So, criterion 1 is equivocal. Number 15 also seems equivocal and would need detailed analysis of outcrops. It also would depend upon peat and coal being *in situ*, which contradicts the Flood model. Number 5 is the dodge used by uniformitarians to explain the lack of rotting of polystrate trees, but this is as expected within a Flood model with rapid deposition. The finding of long roots, criterion 9, does not necessarily mean the trees are *in situ*. The Yellowstone fossil ‘forests’ trees sometimes have long roots (figure 14). There are numerous laminates in the sedimentary rocks but proving that any of them are truly tidal, criterion 11, would be very difficult. Number 6 is a necessary but not sufficient criterion for *in situ* trees in a Flood model, since even vertical trees on upper continental

crust does not necessarily mean they are from pre-Flood growth.

The Florissant redwood stumps would be interpreted as *in situ* based on criterion 1, 8, 13, 14, and possibly 17. However, criterion 9 would indicate transported trees, and the huge variety of fossils found from such different environments would indicate that these trees are not *in situ*. Moreover, the stumps are not consistent with an *in situ* interpretation according to criterion 6, as there are fossiliferous sedimentary rocks below the level of the upright petrified trees (figure 10). Nonetheless, I would suggest that many of the criteria in table 1 are equivocal, but instead a mix of organisms from so many different environments should be a very strong criterion for transport.

Uniformitarian challenges to *in situ* interpretation

Not surprisingly, many aspects of the Florissant fossils are problematic for the uniformitarian principle. The vertical petrified stumps have no roots and the top has been sheared off. Would not the roots also absorb silica from the lahar and be preserved? Why would redwoods grow at high elevation and far from the coast, even in the 'warm' Eocene? The so-called varves have polystrate fossils, such as the opossum and various fish fossils. Many of the fossils are well preserved, and a diatom biofilm does not seem adequate. The fossils indicate a wide variety of environments, from cool temperate, such as spruce, larch, and birch, to numerous subtropical and a few tropical varieties. Tropical and subtropical species growing at a similar altitude as today along with cool, temperate varieties is a climatic contradiction, even in the warm Eocene. A climate like this is very difficult to model.⁵¹ The main problem is that the radiational cooling in the winter of a continental climate at about 2,490 m (8,200 ft) asl would be intense, since winter cooling depends mainly on the angle of the sun and the continentality of the site. It all adds up to the necessity of another explanation. I propose the fossil beds are deposits from log mats floating on top of the Flood water.⁹



Figure 14. Broken long root from a stump at Specimen Creek, Yellowstone National Park, USA. (Perry Fishbaugh pointing to the end of the root). The root of a growing tree lies perpendicular over the petrified root.

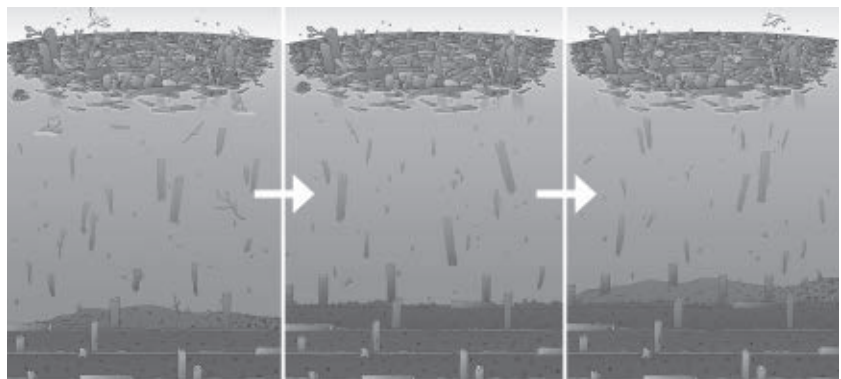


Figure 15. A log mat with trees and other organisms sinking vertically to bottom, while bottom is collecting deposits horizontally from volcanic debris flows forming the Absaroka Volcanics with numerous vertical, petrified trees. (Drawn by Keaton Halley.)

Floating log mats during the Flood explain the fossils

The size of the trees gives the impression that they are very old, perhaps older than the pre-Flood period of about 1,600 years.⁵² But, measurements of the tree rings indicate they are no more than 750 years old (figure 7). Moreover, the trees grew from an environment that was even more healthy than the one where redwoods grow today. This supports the deduction that the pre-Flood environment would have been warm and well-watered.⁵³

Since the Flood/post-Flood boundary is in the late Cenozoic,⁵⁴⁻⁶⁰ the Florissant fossil site would be a result of Noah's Flood. The 32 criteria that I developed to determine

the location of this boundary supports this conclusion. These include subtropical and tropical fossils at mid and high latitudes and at high altitudes in continental areas, and the fact that the sediments are consolidated. Furthermore, the early post-Flood period would be cold due to at least volcanic and impact winter and not allow for the growth of subtropical and tropical plants at this latitude. So, the Flood explanation is the most likely explanation of disharmonic plant, insect, and animal associations, which also supports placing the Flood/post-Flood boundary in the late Cenozoic.

It is most likely the Florissant organisms were deposited after the erosion surface was cut in Pikes Peak granite during the Flood. This surface is a large erosion surface on the high granitic mountains of central Colorado which was likely carved during the early Retreating Stage of the Flood.⁶¹ Most large erosion surfaces likely developed during the Sheet Flow Phase of the Retreating Stage of the Flood.⁶²

Log mats that had been gathering flotsam on their journey floated over the top of the erosion surface.⁹ Trees, mostly redwood, sank vertically to the bottom where they were pinned by volcanic debris. Before they were incorporated into the sediments, they had been sheared off at about 4.5 m (15 ft) in their area of origin during the early Flood. Mount St Helens during the May 18, 1980, eruption demonstrated how quickly wind blast and volcanism can shear trees from their stumps.⁶³ In the Flood, the stumps temporarily left in the ground would eventually be eroded, float, and be incorporated into log mats. Due to air blast, water turbulence, and violent collision, the trees and stumps would be mostly stripped of branches, roots, and bark. The trees eventually became waterlogged and sunk vertically from the log mat.

Figure 15 is a schematic for the deposition of Yellowstone fossil ‘forests’ within the Absaroka Volcanics during the Flood, which would also apply for the Florissant redwoods. Various log mats from different pre-Flood environments floated on the Floodwaters and would often mix, which explains the paleoflora from widely different environments.⁹

At the same time as the trees sank, plant parts also sank. The log mats also carried insects that fell off the mat and sank to the bottom. It is likely that the log mats were vast. What is found in the Florissant ‘lake’ beds is only what became trapped in a little, north-south valley on the erosion surface. Thick sediments must have accumulated over the erosion surface for the sediments to lithify in the valley because it takes a fair amount of overburden to compress and cement sediments. Then later in the Retreating Stage of the Flood, the overburden was eroded away, which means the ‘Tertiary pediment’ is really an exhumed erosion surface. The area continued to uplift, emerged from the Floodwaters, and rose relative to the ocean bottom⁶⁴ to the high elevations observed today in the Colorado Rocky Mountains.

Conclusions

Numerous contradictions to uniformitarianism are found at the Florissant Fossil Beds National Monument, especially the mix of fossils from widely divergent environments. These can be explained by the Retreating Stage of the Flood as the product of log mats, where many trees sank vertically together with plant parts. Numerous insects clinging to the log mat fell off the mat, sank to the bottom, and accumulated within a small valley on an erosion surface.

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The search for Noah and the Flood in ancient Egypt—part 1

Gavin Cox

Was the concept of Noah and the Flood incorporated into ancient Egyptian religion and belief? Such a concept can be recognized in the “Hermopolitan Ogdoad”, a mythical Egyptian cosmology involving eight creator deities, comprising four males and their female consorts. This two-part article will explore this group of eight and their connections to Noah, his family, and the Flood. I will start my investigation with the most ancient evidence first, found in the 5th Dynasty Pyramid Texts and progress through history up to later stages, including a survey of the Coffin Texts (funerary spells), Book of the Dead, and Pharaonic temple inscriptions. My investigation will proceed based upon 10 search parameters, or predictions, for Egyptian history and religion, which will form the basis of this series of articles, based upon the implications of the biblical text of the Genesis 5 and 11 chronogenealogies and Flood narrative of Genesis 6–9.

Why Egypt has not been the focus for the search for Noah and the Flood

Simply put, it is a matter of worldviews. Modern biblical scholarship abandoned any notion of regarding the early chapters of Genesis as anything other than legend. For more than a century, it has been maintained that Genesis borrowed its source material from Babylonian mythology, specifically the *Enuma elish*, for its Creation and Flood account, and that Genesis 1–11 represented the work of a priestly editor ‘P’, during or after the Babylonian Exile. In other words, why look for mythical people, like Noah and sons, or a mythical global Flood? And why look in any other place than Babylon for the source of these myths, when scholarship allegedly settled such questions long ago?

Scripture: Noah and the Flood

The Hebrew Bible directly links Noah’s family with the name of the modern territory we know as Egypt, derived from its Greek name ‘Αίgyptos’ (Αἴγυπτος).¹ The Psalms calls Egypt by the name of Noah’s youngest son, Ham, four times (78:51; 105:23, 27; 106:22) and the Semitic designation for Egypt—‘Mizraim’—from the name of Noah’s grandson through Ham, appears some 680 times in the Hebrew Bible.

Outside of Genesis, Noah and the Flood appear within the following passages: 1 Chronicles 1:4; Isaiah 54:9; and Ezekiel 14:14, 20. In the New Testament, Noah and Shem appear within the genealogy of Jesus in Luke 3:36, as historic figures. Jesus draws on the reality of the Flood of Noah’s day to refer to His own second coming, and accompanying universal judgment of sin (Matthew 24:37–38; Luke 17:26–27). The New Testament writers treat Noah as a historic figure and the Flood as global (Hebrews 11:7; 1 Peter 3:20; 2 Peter 2:5). If Scripture consistently treats Noah and

the Flood as historical, then we must too. Therefore, an extra-biblical search for Noah and the Flood is in order, as they must have left their mark upon history in some recognizable form. Indeed, over 500 Flood legends around the world are known of,² but this study will proceed with a search in the history of ancient Egypt.

Caution: a flood or the Flood?

The river Nile has flooded yearly ever since the existence of Egypt, and the annual flood was always seen in religious terms by the Egyptians due to their dependence upon it. The Pharaoh’s responsibility was to maintain balance in creation (*ma’at*), so that the Nile flood remained beneficial, rather than too high—devastating crops and buildings—or too low—leading to food shortages. Therefore, any text that mentions a ‘flood’ will need to be read closely in context so as to avoid importing notions of the biblical global Flood onto a local Nile flood.³

Genesis chronogenealogies place Noah and Shem into Abraham’s era

From Genesis 5 and 11, the MT (Masoretic Text) chronogenealogical information places Noah and Shem into Abraham’s era. This is particularly evident when the information is graphed (see figure 1), demonstrating that at the time of Noah’s death, Abraham was born, and Shem outlived Abraham. That being the case, the incredible longevity of Noah and his family would have been seen as remarkable, even god-like, by those who knew them, but died before them. Furthermore, Noah’s family were sole survivors of the Flood, carrying with them all pre-Flood knowledge, technology, history, and the true faith of God. We can therefore ask relevant questions (based on the

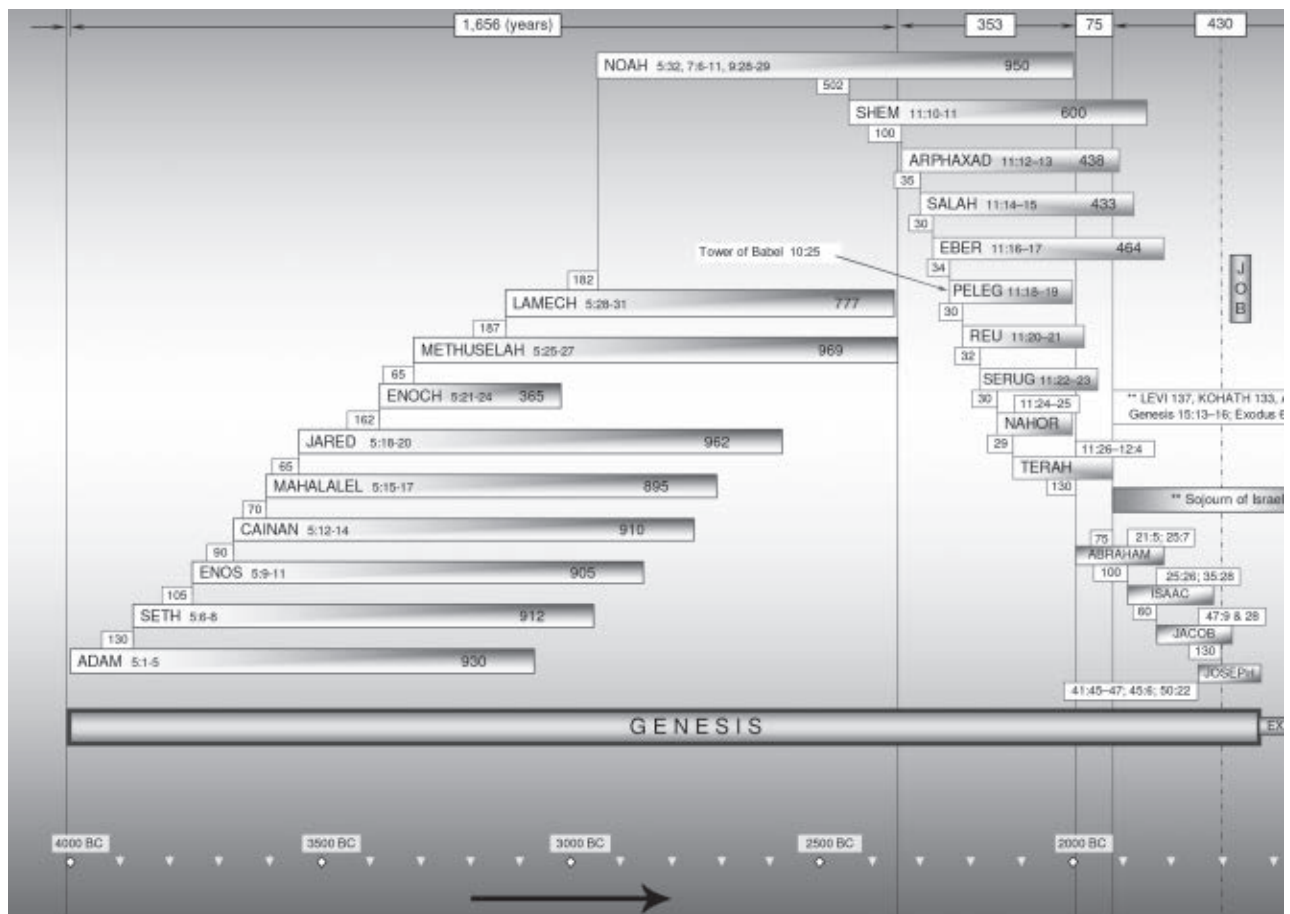


Figure 1. Genesis 5 and 11 reveals overlapping chronogenaealogies (after Paul Hansen⁴).



Figure 2. Ten search parameters based on the biblical text

implications of the biblical text) and set up search parameters, or predictions for Egyptian history and religion, from which to proceed (figure 2).

Discussion

From the biblical text, Egypt should be understood as a post-Babel civilisation (Genesis 11:1–9). If Noah, his family,

and the Flood are recorded in secular history, we should expect to see evidence in Egypt's earliest writings. The 5th Dynasty Pyramids at Saqqara, dated between 2321–2306 BC,⁵ are the earliest writings known from Egypt. However, these conventional dates cannot be accepted, as this places these pyramids' construction at the time of the Flood (2304 BC \pm 11 years⁶), assuming the MT timescale.

As the Genesis record suggests, Noah's son Ham and grandson Mizraim settled in Egypt, taking with them (all-but in paganized form) the memory of Noah's family and the Flood. However, it seems likely that Ham and his family line slipped into apostasy (based on the implications of Genesis 9:20–27). Nevertheless, the accounts of Creation and the Flood passed on from Ham, although corrupted by idolatry, would retain some aspects of the truth.

Noah and family: deified ancestors

Genesis 9:28–29 and 11:11 indicate Noah and Shem lived to 950 and 600 years respectively, outliving everyone around them. Having survived the Flood, carried the sum-total of human knowledge into the new world and started life afresh, it would be likely that Noah and sons became

deified ancestors in the pagan religions. That being the case, would Egypt's pharaohs make reference to them as gods within their associated writings? Therefore, based on the implications of the biblical text, a search will be made in Pharaonic inscriptions for references to the Flood and the memory of the eight.

If Noah's family became objects of pagan worship as deified ancestors, then it would be likely that they had their own worship temple and centre, predicting a 'cult of the eight' in ancient Egypt, with its own temple, lore, and textual tradition.

Also, the names of Noah, Ham, Shem, and Japheth should be preserved in ancient Egyptian onomastics,⁷ if Ham passed on the knowledge of them to his sons and so forth. Not only the names, but their meanings—when compared to the Hebrew Bible and the Egyptian language—should show some evidence of transfer.

Being the founders of civilization would logically offer the possibility of Noah and sons' names being used as 'inventor/pioneer eponyms'. That is to say, the people behind inventions tend to lend their names to their inventions.⁸

Despite having such huge lifespans, Noah's family eventually died, so where were they buried? Ham and his son Mizraim would naturally be buried in Egypt, so a tomb to the eight Flood survivors would mark their memory, if not their actual bodies. So, is there such a tomb that clearly references them and the great Flood in its inscriptions?

The search criteria/predictions discussed here logically flow out of the implications of the biblical text dealing with Noah, his sons, and the Flood. Their experiences were extraordinary, and would therefore leave some kind of footprint in world history, specifically Egyptian history, and religion, which should be discernible.

Where to begin?—introducing the Ogdoad

Egyptologists are well aware of a group of eight gods known as the Ogdoad derived from the Greek meaning 'eight', which in modern hieroglyphic transliteration is written *hmnw* (Khemnw). The Ogdoad are also well known in later Ptolomaic and Roman period texts where they receive much theological speculation.⁹ Egyptologist David Silverman

Table 1. Related roots for Noah, Ham, Shem, and Japheth

Name	Lexical ref.	Related root
Noah	1320–1323	"eminency, distinction, beautify, home, pasture, rest, settle down, quietness, soothing, resting place"
Ham	674, 677, 625a	"father-in-law, hot, heat"; "darkened, dark brown or black"
Shem	2405	"name"
Japheth	3315 (Strongs)	"be spacious, wide, open"

Table 2. Egyptian roots related to Ogdoad names

Name	Lexical ref.	Related root
Nu	II, 215.5–6; V, 375.29; III, 373.5; III, 288.12–15; 2, 221.3–19	<i>nw</i> (Ogdoad name), <i>tnw</i> "eminency, distinguish", <i>hnw</i> "home", <i>hnw</i> "resting place, abode", <i>nwy</i> "flood, water, wave"
Kek	5, 144.13; 5, 144.6; 5, 144.15	<i>kk.w</i> (Ogdoad name), <i>kk.w</i> "darkness", <i>kk.w</i> "flood water"
Amun	1, 85.3–7; 1, 83.12–18; 1, 84.8–9; 1, 84.2–3; 2, 64.13–65.2; 2, 65.6–8; 2, 69.6	<i>jmn.t</i> (Ogdoad name), <i>jmn</i> "to hide, be hidden", <i>jmn.t</i> "secret", <i>jmn-m=f</i> "Amun, hidden of name"; <i>mn</i> "so and so, someone"; <i>mn.t</i> "the like, contents"; <i>mn.t</i> "origin of the waters"
Heh	3, 152.11; 3, 152.9–10; 3, 152.14–153.24; 3, 151.3–152.4; 2, 299.2–302.9	<i>hh.w</i> (Ogdoad name), <i>hh</i> "million", <i>hh</i> "to seek"; <i>nhh</i> "eternity", <i>hh</i> "to flood"

offers an introductory summary of them explaining their role in Egyptian cosmological theology concerning the creation of the universe from the watery abys called the Nun:

"... in a series of abstract concepts: waterness (*nwy*) ... the most basic qualities, enshrined in the names of the water (Nu, Nun); infinity (*hhw*); darkness (*kkw*); (*tnmw*, literally 'lostness') or hiddenness (*jmnw*) ... they are usually depicted as four pairs of gods and goddesses, whose names are masculine and feminine counterparts of each other: Nun and Naunet, Huh and Hauhet, Kuk and Kauket, Ammun and Amuanet. Collectively, the eight deities are known as the Ogdoad ... [who] were venerated as creator-deities: 'the fathers and mothers who were before the original gods' ..."¹⁰

The earliest complete set of names and images of the Ogdoad, discovered (so far) by archaeologists, comes from the 26th Dynasty tombs of El-Bawiti (664–525 BC) in the oasis of Baharia. Excavations there carried out by Fakhry in 1942 revealed four rock-hewn tombs of wealthy individuals from the village of El-Bawiti. The tombs of two individuals



Figure 3. Ogdoad assist the air-god Shu, supporting the sky (from Fakhry¹¹).



Figure 4. Ogdoad assist Shu with four deities supporting the sky (from Fakhry¹²).

(Ba-n-nentiu and Ped'ashtar) are of specific interest, as they preserve inscriptions displaying names and images of the Ogdoad (figure 3).

The Ogdoad pictured in figure 3 (lower register) is shown anthropomorphic and serpent-headed (creatures the Egyptians associated with water) and comprise four males and their female consorts, whose names are written in cartouches above their heads. Figure 4, (lower register) shows, with a complete set of names, the Ogdoad as apes (creatures the Egyptians associated with worship of the first sunrise at creation,¹³ unnamed images of which occur in earlier Middle Kingdom temple inscriptions, see part 2). Both depictions show the Ogdoad assisting the air god Shu in supporting the sky, upon which the solar bark of the sun god Re sails, an image which will be discussed later in more ancient Pharaonic inscriptions. The Egyptians believed the Ogdoad's role was to maintain creation's balance, by stopping the sky from collapsing back into the Nun (the Egyptian idea of a primeval flood), which in Egyptian cosmology was believed to be a state of chaos, from which the creation emerged. This is strikingly parallel to the concepts of Creation as revealed in Genesis 1 and also mirrored within the Flood account in the role of the *tehôm*—the Great Deep. The names of these gods are written above their heads in cartouches, and are as follows. The chief god is called Nu—which is

phonetically similar to Noah, Nu's wife is the feminine form—Naunet. The other gods are Heh and Hauhet, Kek and Kauket, and Amun and Amaunet.¹⁴ (The modern transliterations for these names are as follows: *nw, nw.t, hh, hh.t, kk, kk.t, jmn, jmn.t*. Their meanings will be discussed briefly below, but more fully in a separate article.) It is my conviction that these male names, Nu, Kek, Amun, and Heh, are the equivalent Egyptian religious names of Noah, Ham, Shem, and Japheth (the consort names are merely the feminine forms of the same names). I will compare the meanings of these names briefly (see table 2), which can act as a working hypothesis, but will be established in depth in a separate article.

Meanings: Noah and sons vs Ogdoad names

Meanings of names are established in the Hebrew Bible from their related phonetic roots (typically three letters that form the core sound of a word).¹⁵

This is seen especially in Genesis

where names are often played upon in terms of related sounding words in order to establish their meanings. The OT contains over 80 explicit etymologies, where “proper nouns designating persons and places are given a semantic interpretation based on phonetic correspondences”.¹⁶ The meaning of Noah's name can be derived from Lamech's prophetic naming of Noah in Genesis 5:29, where the related word “comfort” seems to be played upon. Shem and Japheth's names are understood from Noah's blessing and curse after his drunkenness (Genesis 9:25–28). Shem shares his identity/“name” with YWHW, and Japheth's blessing is said to be “enlarged”. Both blessings play upon the phonetic correspondents of the son's names. From the standard Hebrew lexicons¹⁷ the following related roots define the meanings of the names of Noah and his sons (table 1).

Meanings of the names of the Ogdoad are derived from contextual evidence from the texts from which they occur. Egyptologist Geraldine Pinch summarizes these names as follows:

“Nun and his female counterpart Naunet, the deities of the primeval waters ... Amun and Amunete, deities of invisible power, or the breath of life ... Primeval darkness was represented by Kek and Keket ... Heh and Hehet ... may originally have embodied the strong currents in the Primeval Waters”.¹⁸

“A single Heh god was the hieroglyphic sign for ‘millions of years’ or infinity.”¹⁹

The standard Egyptian lexicons²⁰ were selected for the following vocabulary which share their phonetic roots with the names of the Ogdoad, which have been selected for in table 2.²¹ The oldest known examples are preferred, typically from the Old Kingdom.

When comparing tables 1 and 2 it becomes apparent that the names of Noah and sons overlap with the Ogdoad male names, with either equivalent meanings, or similar concepts. The “restfulness” and “homely” aspects of Noah’s name are shared by roots common to nw. The “darkness” of Ham is shared with Kek. Shem’s identity as “name” is shared with that of Amun, who is “hidden (of name)”, “secret”, or appears as a root in words for ‘identity’. Japheth, meaning “enlarged”, has similar concepts compared to Heh, which shares its root with “millions” and “eternity”. Furthermore, each root *nw*, *kk*, *jmn*, *hh* has its own Flood term, which is a noteworthy observation. The following relationships, as a working hypothesis, are summarized below:

Noah ≈ Nu
Ham ≈ Kek
Shem ≈ Amun
Japheth ≈ Heh

The connections are intriguing and deserve further investigation, so more evidence will be discussed in a separate article.

The Ogdoad and the Flood in the Pyramid Texts

By the end of the Old Kingdom, texts were being inscribed on the walls and corridors of Pharaonic pyramids (located on the plain of Saqqara, 20km south of modern Cairo), known by modern scholarship as the Pyramid Texts (PT). Saqqara is also known as the location of the first pyramid to be constructed in Egypt—the stepped pyramid of King Djoser (3rd Dynasty), see figure 5.²² The 5th Dynasty texts, which are highly esoteric spells for the afterlife, represent the oldest corpus of religious writings preserved from ancient Egypt. The first pharaoh to incorporate these magical spells into his pyramid was Unas, (W) who was the last king of the 5th Dynasty. The texts are to be found within his burial-chamber (see figure 6, below).

Other pyramids of interest are Pepi Meryre I pyramid, Queen Neith (Nt) (daughter of Pepi I), Merenre and Pepi Meryre I pyramids. These contain the names associated with the Ogdoad—specifically two pairs, Nu and Naunet, and Amun and Amaunet in Unas pyramid spell W 301§446.²⁴ PT text 585§1580b–1581, located in Queen Neith’s chamber, refers specifically to the Ogdoad as an unnamed group, or possibly the city dedicated to them²⁵ (see part 2), repeated in Merenre and Pepi Meryre I pyramids (740§2270 and

Table 3. PT occurrences of Ogdoad and Great Flood terms

Ogdoad name	Pyramid Text reference
<i>Hmnw</i> (Ogdoad name) + <i>Jmn</i> (Name) + <i>Nw</i> (Name)	585§1580b+1579b+1583a
<i>Nw</i> (Name) + <i>kk</i> (darkness)	362§606+605
<i>nw</i> (abyss) + <i>kk</i> (darkness)	260§318+319+322
<i>Nw</i> (Name) + <i>Nn.t</i> (Name)	301§446; 606§1691+1692
<i>nw</i> (abyss) + <i>jmn</i> (hidden) + <i>nhh</i> (million, eternity) + <i>tkk.t</i> ('Attacker?')	627§1778+1780b+1778+1781+1785a,b+1772c
<i>Jmn</i> (Name) + <i>Jmn.t</i> (Name)	301§446c
<i>Jmn</i> (Name) + <i>hh</i> (eternity)	273§399+412a,b,c+414c
<i>Tnm.w</i> (Name) + <i>Hmnw</i> (Ogdoad name)	585§1579
<i>Hh</i> (Name)	406§709; 558§1390
Flood term	Pyramid Text reference
<i>mhy.t-wr.t</i> (Great Flood)	254§289c; 493§1059c; 496§1066d-e; 510§1131a-b;
<i>gb.w-wr</i> (Great Flood)	311§497b, 608; 344§559b; 348§565a-b; 492§1058c; 513§1172c-1173a



Figure 5. Djoser’s stepped pyramid, Saqqara, Egypt (Gavin Cox seated second from right; photo taken 1999)

585§1580b–1581).²⁶ Two terms for the Great Flood occur. The divine title *mhy.t-wr.t* (“Great Flood”) occurs in W 317§508; and Nt 493§1059 which states: “May you cause

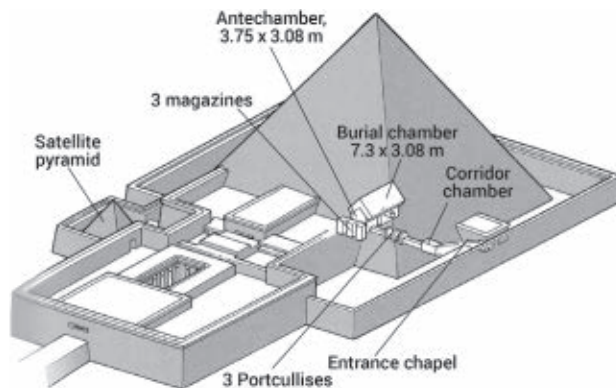


Figure 6. Unas pyramid 3D plan, in Lehner²³

that Neith eat as Ne[per] who comes into being there, like Osiris who is upon the Great Flood.”²⁷ The other term for “Great Flood” is *ꜥgb.w-wr*, which occurs in Pepi I pyramid and Unas pyramid. From Egyptologist R.O. Faulkner’s translation, PT311§498–500 states:

“... contend with fierce roaring(?) with those who are in trouble, with those whom they would destroy. May they not make opposition when I turn to you ... this name of yours of Great Flood”

These Flood titles will be discussed later. An analysis of the Pyramid Texts demonstrates that all the names associated with the Ogdoad are present, appearing either as divine names, or impersonal, cosmological concepts, along with two terms for the ‘Great Flood’. Table 3 summarizes every occurrence.

From the evidence presented, it is clear that the term ‘Ogdoad’, along with their titles, appear in the PT corpus, either as divine names or cosmological concepts, along with two terms for the ‘Great Flood’. Because these names appear in the oldest Egyptian texts we can be confident that they are not a later invention. (The two terms for Great Flood in PT also occur in later texts, which will be discussed, are cosmological and religious in scope, and are never used in reference to Nile floods.)

Ogdoad and the Flood in the Coffin Texts

Do these Ogdoad and Flood names and concepts survive into later stages of Egyptian history? To answer that question we need to investigate the next most-ancient literary corpus, that of the Egyptian Coffin Texts (CT), which represent funerary spells adorning coffins during the Middle Kingdom (ca. 1980–1760 BC) (figure 7).²⁸ CTs are so called because they were written in ink on interiors, and more rarely exteriors of coffins belonging to wealthy Middle Kingdom Egyptians.²⁹ Other, rarer texts have been found on papyri, mummy masks, canopic jars, tomb walls, and stelae.³⁰ CTs cover a diverse set of genres including hymns, prayers, and magical spells. Subject matters include identifications of gods, demons, and places of the afterlife, and are often

highly esoteric, jumbled, and confused.³¹ Such texts formed collections which were regarded by the ancient Egyptians as guidebooks to the afterlife, similar in function to Old Kingdom PTs.³² The following CT spells are of interest from a point of view of discussing the Ogdoad.

The title “eight Chaos-gods” which take their name from Ogdoad member Heh, occurs in CTs 76, 78–81³³, (known as the “Book of Shu”—Shu being the name of the air-god), and the title “Chaos-gods” occurs in CTs 48, 50, 75, 107. These are listed below (extracted from Faulkner’s translation).³⁴

The eight Chaos-gods (*Heh*-gods) in CT

76:1 “O you eight Chaos-gods who are in charge of the chambers of the sky ... 6 I who again begot the Chaos-gods in chaos, in the Abyss, in darkness and in gloom ... 7 O you eight Chaos-gods whom I created ... whose names Atum made when the Abyss was created ... when 8 Atum spoke in it with Nu in chaos, in darkness and in gloom”

78:2 “O you eight Chaos-gods whom Shu conceived ... whom Nu begot”

79:23 “O you eight Chaos-gods who went forth from Shu, whose names ... Atum created in accordance with the word of Nu in chaos, in the Abyss, in darkness and in gloom”

80:1 “O you eight Chaos-gods, being veritable Chaos-gods, who encircle the sky with your arms ... I am everlasting, who fashioned the Chaos-gods”

81:3 “To be recited over eight chaos-gods”

107:118 “O Nu in company with the Chaos-gods”

665:1 “Geb has sat beside him, the Chaos-god goes forth ... the strife-makers are execrated(?), for they cause plundering and they foretell the flood (*gb*), they see what is allotted when strife comes”

1130:470 “I have made the Great Flood (*gb-wr*) ... Prepare a path for me, that I may see Nuw and Amun.”

CT occurrences of divine names or impersonal allusions connected to the Ogdoad

An exhaustive list of all the occurrences in CT in Faulkner³⁵ of the names and equivalent vocabulary related to the Ogdoad, is presented in table 4 below, either occurring as divine names or cosmological forces (cf).

CT 1130 is known from five coffins (figure 7; British Museum, EA30842) found at el-Bersha, the city cemetery of Khemnw (Eight City, see later discussion). Within CT 1130, Ogdoad names Nu and Amun can be seen, along with the term *gb-wr*, meaning Great Flood. The context seems to be describing the Flood as a “good deed” of creation. Only after this is mankind’s rebellion (*sbi*) and disobedience mentioned, along with a passage dealing with man’s creation from the god’s tears. Terms for ‘flood’ do occur in the Coffin Texts but the contexts are often confused (as in the case of CT 1130) or too brief to determine what kind of flood is

being referred to, i.e. the beneficial Nile flood, the cosmological flood of the heavens, or the global Flood being sent in judgment. Possibly an exception may be CT 665 mentioned above, which reads as a flood passage in the context of judgment brought by a *Hēh*-god.

The following conclusions can be drawn from this CT analysis:

1. Ogdoad names occur in the Middle Kingdom CTs both as divine names and cosmological forces.
2. Terms Khemnwn (Eight City of the Ogdoad) and eight Chaos-gods (*hh*) appear together in CT.
3. *nw* is a common term that occurs as a divine name and as an impersonal, cosmological force.
4. *kk* is a common cosmological, impersonal term.
5. *nw*, *tnm.w*, *hh* occur as divine names and impersonal, cosmological concepts. (It must be noted here *tnm.w* is recognized as an alternate name for Amun of the Ogdoad, deriving from PT 585§1579.)³⁶
6. A significant quartet of impersonal, cosmological concepts/forces occurs alongside the divine title eight Chaos-gods, that of: *nw*, *kk*, *hh* and *tnm.w*. This combination is particularly striking in CT 76 where this quartet is named together 12 times, and once in CT 79, 80.
7. Khemnwn + Chaos-gods occur together in CT 50, indicating a link between the place of the Ogdoad and the Chaos-gods.
8. CT 1130 Ogdoad members Niw and Amun appear together with *hh* as a cosmological force, in a passage which mentions Creation, mankind's rebellion (*sbi*), and a Great Flood (*3gb-wr*).
9. Flood terms do occur in CT, but their contexts are often too brief, or too confusing as to determine what the flood is referring to.

Conclusion

This study has identified 10 search parameters, or predictions, based upon the implications of the biblical text of Genesis 5 and 11, chronogenealogies and Flood account Genesis 6–9, as historic events. These predictions take into



Figure 7. Coffins similar to this example from el-Birsha are inscribed with Coffin Texts.

Table 4. Shared CT occurrences of Ogdoad names and/or cosmological forces (cf)

Shared occurrences	CT reference
Khemnwn (Eight City) + Chaos-gods	50:232+223,225
Chaos-god(s) (Name) + <i>Nw</i> (Name)	75:324+334; 76:1,6+8; 78:22+19; 79:26+24; 80:27,31+33–35; 107:118+118; 132:153+153; 714:344+344
Eight Chaos-gods (Name) + <i>Nw</i> (Name) + <i>hh</i> (cf) + <i>kk.w</i> (cf) + <i>tnm.w</i> (cf)	76:1+5, 7+8; 79:23+24; 80:27+28
<i>Nw</i> (Name) + <i>hh.w</i> (cf) + <i>kk.w</i> (cf) + <i>tnm.w</i> (cf)	76:8; 79:24
<i>nw</i> (cf) + <i>hh.w</i> (cf) + <i>kk.w</i> (cf) + <i>tnm.w</i> (cf)	76:5, 6, 10, 11, 12, 12, 13, 13, 14, 15, 17; 79:24; 80:28
<i>Niw</i> (Name) + <i>Imn</i> (Name) + <i>hh.w</i> (cf)	1130:470, 466

account the influence the Flood, Noah, and his sons would have made on religion and culture. As the Bible clearly links Egypt with Ham and his son Mizraim, this study has concentrated its efforts there. The question has been asked, is there a memory of Noah and the Flood readily identifiable in the religious writings of ancient Egypt? Part 1 has begun to build a positive case to these ends. So far, a group of eight gods, known from 26th Dynasty religious texts, have been identified as a likely candidate, consisting of four males and their female consorts (known by the Greeks as the Ogdoad, and by the Egyptians as Khemnwn, meaning ‘eight’). They are clearly linked with Egyptian cosmological ideas involving a watery abyss called the Nun and possess a complete set of names written in cartouches above the deities’ heads. The chief, male, Ogdoad member is called Nu, which is phonetically similar to the biblical Noah. When the meaning

of the Hebrew names of Noah and sons are compared to that of the male members of the Ogdoad, some intriguing connections are revealed, either in terms of direct meaning or parallel concepts.

Prediction 1 requires these names to demonstrate the deepest of antiquity. It has been found that these names appear as divine titles or cosmological concepts as far back as Egypt's oldest known texts—the 5th Dynasty Pyramid Texts. These texts contain the names known from later history that make up the Ogdoad, along with their designation Khemnwn (either referring to the eight gods, or “Eight City”, being the city of the Ogdoad, see part 2), and two terms for the Great Flood. These names can be traced into the next literary corpus known in ancient Egypt, that of the Middle Kingdom Coffin Texts.

Part 2 will investigate later textual sources including funerary and temple inscriptions, so as to build the case that Noah, his family, and the Flood are known in ancient Egypt. A separate article will investigate further linguistic connections to Noah's family and the Ogdoad in terms of meaning and religious function.

Acknowledgments

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The search for Noah and the Flood in ancient Egypt—part 2

Gavin Cox

Was the concept of Noah and the Flood incorporated into ancient Egyptian religion and belief? Such a concept can be recognized in the ‘Hermopolitan Ogdoad’, a mythical Egyptian cosmology involving eight creator deities, comprising four males and their female consorts. This article will explore this group of eight and their connections to Noah, his family, and the Flood. I will continue my investigation with New Kingdom evidence first, found in well-known pharaonic funerary inscriptions, then the later *Book of the Dead* and progress through history up to later stages, including a survey of evidence of temple worship and the burial tomb of the Ogdoad. My investigation will proceed based upon 10 search parameters, or predictions for Egyptian history and religion, based upon the implications of the biblical text of the Genesis 5 and 11 chronogenealogies and Flood narrative of Genesis 6–9.

The Ogdoad and the Flood in the New Kingdom

In this article I will discuss several New Kingdom (NK) sources of information for the Ogdoad and/or the eight *Hēh*-gods who are associated with the Flood. These sources are themselves elevated to great significance as they appear in the funerary inscriptions of some of the most well-known pharaohs in history. Two religious sources for information regarding the Ogdoad will be analyzed, firstly, *Book of the Heavenly Cow* (HC) and *Book of the Dead* (BD), particularly focusing on BD 175.

Book of the Heavenly Cow and the Ogdoad

The myth of the Heavenly Cow is preserved in several versions, dating to the NK (c. 1539–1077 BC).¹ Of specific interest is the appearance of the eight *Hēh*-gods, who function within the story by assisting Shu in supporting the sky.² The eight *Hēh*-gods stop the sky from collapsing, so preventing creation from returning to its original primeval condition represented by Nun—the embodiment of the Flood.³ HC describes mankind’s rebellion (*sbi*) against Re, his ordering mankind’s destruction, and subsequent reorganization of the cosmos, before permanently retiring to heaven. Egyptologists have noted HC is reminiscent of Mesopotamian and biblical passages concerning the Flood and destruction of mankind due to their shared themes of rebellion and judgment by the Flood.⁴ Within HC, Nu, the ‘father of the gods’, is summoned to the divine council for his advice, where he proclaims the judgment of man’s destruction by Hathor. This is followed by a ‘flood’,⁵ the purpose of which is to trick Hathor and pacify her anger thereby saving a remnant of mankind.⁶

HC is first attested from the time of Tutankhamun (NK, 18th dynasty, c. 1324 BC), and subsequent versions appeared in tomb inscriptions of Seti I, Ramses II, III, and IV⁷ (19th dynasty), located within subsidiary rooms of the kings’

sarcophagus chambers, reserved exclusively for these inscriptions. The dates of these texts extend through NK from the 18th to the 20th Dynasties.

Passages from HC appear for the first time in Tutankhamun’s shrine I, but sources for the myth are to be detected in the most ancient of texts, specifically the *Pyramid Texts* (PT), where the Cow’s title, *mhyt-wrt*, “Great Flood” occurs in five spells (as discussed in part 1) along with the eight *Hēh*-gods as supports for the sky.⁸ Within the Coffin Texts (CT), direct allusions to HC can be discerned. In CT 79, the eight *Hēh*-gods appear alongside Nu, where Re is described as resting on the Heavenly Cow—“Great Flood”.

Tutankhamun, the Great Flood and the eight *Hēh*-gods

‘Shrine I’ is the outermost and largest of Tutankhamun’s shrines (figure 1) richly decorated within and without with text. On the left, and back panels, are passages from HC, including imagery on the back panel of the Great Flood (represented by the Heavenly Cow), supported by Shu, and assisted by the eight *Hēh*-gods. The belly of the Cow is covered with stars, representing the sky, where Ra is depicted sailing in his solar bark (figure 2). It should be noted here that the function of the eight *Hēh*-gods aiding Shu in supporting the sky is identical in function to that of the Ogdoad, aiding Shu in supporting the sky, as seen in the 26th dynasty tombs at el-Bawiti, thereby establishing the identity of the eight *Hēh*-gods as that of the Ogdoad. In other words, the Ogdoad who represent the eight *Hēh*-gods, prevent the cosmos from being destroyed by the Flood.

In Tutankhamun’s shrine 1, the image of the Cow is framed by the inscription:

“Words spoken by (the Cow) the Great Flood: Come my son of my body, my beloved one, Lord of the Two

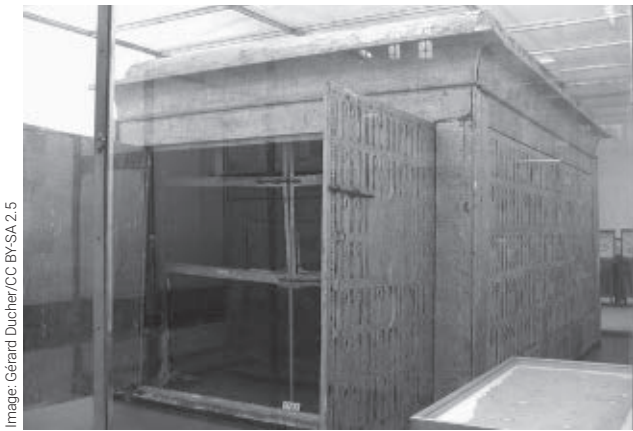
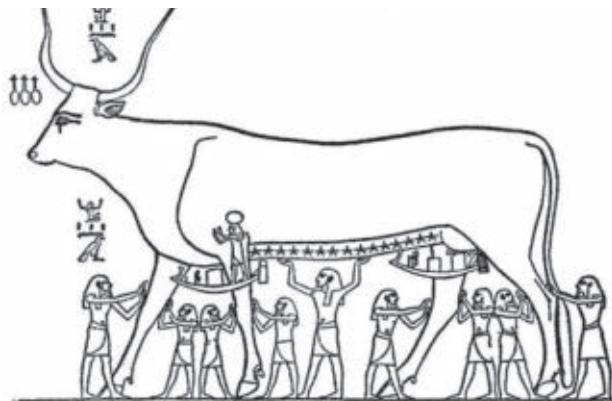
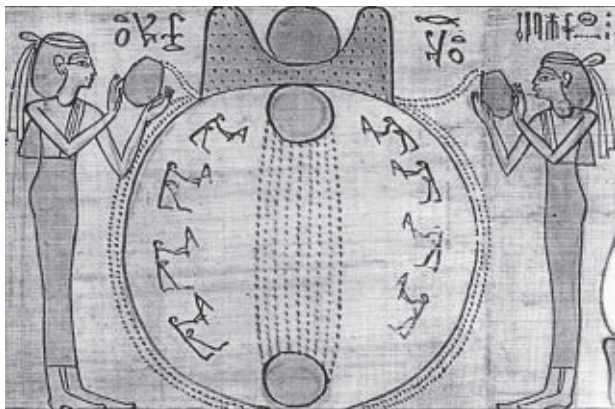


Image: Gérard Ducher/CC BY-SA 2.5

Figure 1. Tutankhamun shrine I (Wikipedia Commons CC BY-SA 2.5)

Figure 2. The eight Heh-gods assist Shu supporting the Heavenly Cow (Great Flood), Tutankhamun shrine I, in Piankoff⁹Figure 3. Khonsumes papyrus, Ogdoad hoe the earth, in Silverman¹⁸

Lands Neb-Kheperu-Re. Be with thy father Re as one of these gods who are in his following at the side of (the Cow) the Great Flood. Osiris, King Tutankhamun, ruler of Heliopolis of the South, lives—he will not die again in the Necropolis!”¹⁰

It should be noted that the name Tutankhamun (*Amen-tut-ankh*) is itself connected to the Ogdoad, as the boy-king’s name means “living image of Amun”; Amun being one of the

male members of the Ogdoad, who by this time had become an important god in his own right. So Tutankhamun having inscriptions of the Great Flood and the Eight gods inscribed on his funerary chapel is consistent with his Amun title. The memory of the Eight and the Great Flood is also shared by some of the greatest names in pharaonic history.

Book of the Dead

The Book of the Dead (BD), known by the Egyptians as “going out in daylight” (*pṛt m hrw*), has a history that spans one and a half thousand years c. 1450 BC to 50 AD.¹¹ At the start of the New Kingdom (18th dynasty), BD was still in the process of formation, and only by the Saite period (26th dynasty) did BD reach its final canon, when all the spells were organized into an established order of chapters. BD comprises a large set of spells whose function was to ensure the resurrection of the deceased and their security in the afterlife. BD is the successor to the Middle Kingdom CTs and Old Kingdom PTs, representing religious funerary rituals and spells which were collected and inscribed on papyrus scrolls, becoming available to purchasers for their burials. BD texts use cursive hieroglyphs, and are accompanied by colourful ink vignettes.

The Ogdoad and the Flood in BD

Texts that refer to the Ogdoad include BD 27:2, “for as for this heart of mine it is the great heart that is in the Ogdoad”.¹² BD 164:2 (known from a 26th dynasty copy, c. 350 BC)¹³ states: “The Ogdoad (and) the living souls who are in their coffins (*ḏb t*) are praising thy dignity ...”¹⁴ (Interestingly, the Hebrew word used for Noah’s ark is *tēbat*, recognized as a transliteration of *ḏb t*, the Egyptian word for coffin.¹⁵ (The idea of the Ogdoad in their coffins as ‘dead gods’, will be discussed later).¹⁶ *Heh* is mentioned singularly in BD 150:2, “Abode of *Heh*”.¹⁷ A significant BD vignette illustrates the Ogdoad (figure 3), from the 21st dynasty papyrus of Khenumose, priest of Amun (his hieroglyph can be seen top right). The vignette shows the sun rising in three stages on the first day of creation before setting behind the twin horizon of the primeval mound. Two goddesses representing North (right) and South (left) pour out the waters of Nun. On the primeval mound are shown the Ogdoad—as eight creator divinities hoeing the earth. This is very evocative of Noah’s family disembarking and setting up agriculture as outlined in Genesis 9:18. This vignette may well represent a cultural memory of Noah and his family starting agriculture afresh in the post-Flood soils, bringing forth the first crops—in effect creating anew the conditions for human life to flourish. Therefore, the Egyptians would naturally commemorate them as creator gods.

Images of Nu standing in the Nun holding up the solar-bark containing seven gods and/or the Ogdoad is an image

seen on temple walls of pharaohs¹⁹ and is depicted in the 19th dynasty BD papyrus of Ani,²⁰ (figure 4). Nu entirely takes over the function of the eight *Hēh*-gods and the Ogdoad in supporting the sky, enabling Ra to sail in his sun bark, thereby preventing the sky's collapse and a return to chaos and Nun.

The Ogdoad and the Flood in BD 175

BD 175 includes a description of a cosmos destroying flood, resulting in Osiris and Atum (transformed as a snake) remaining alone, together with impersonal concepts of *Nu* and *Hēh*—representing an example of individual Ogdoad members functioning within funerary literature.²² Thoth is the chief deity being addressed at the beginning, who, it should be noted, is lord of *hmnw* (Khemnw, City of the Eight). The passage contains a divine complaint against the evil, rebellion (*sbi*), and violence of mankind. Part of the divine judgment is that mankind's time would be limited, and that everything created would be destroyed by the Flood. The following lines from BD 175 are taken from Quirke's 2013 translation:

“(4). O Thoth, what is to happen (5) with the children of Nut. (6) They have made tumult, they have raised strife, (7) they have done evil, they have formed rebellions (*sbiw*), (8) they have caused slaughter ... (13) You shall not see evil, you shall not suffer. (14) Their years are limited, (15) their months are closing in ... (51) and I shall indeed destroy all I made, (52) and this land shall turn into Nun, (53) as a floodwater, as its original condition ...”²³

Table 1 below, explores and tabulates vocabulary that theoretically serves as scribal allusions to the four names associated with the Ogdoad within this passage of judgment and destruction in BD 175.

The chaos and return to Nun described here may well be accented by puns and scribal play-on-words referencing the Ogdoad as chaos gods. The divine complaint resulting in the Flood judgment is due to moral failure on the part of mankind, described as rebellion (*sbi*), evil and violence and conceptually parallel to the divine complaint recorded in Genesis 6:5, 11. BD 175:14 describes man's years as being “limited” and their months as “closing in”, is evocative of the divine curse of Genesis 6:3 limiting the timeframe of mankind to 120 years, presumably before the Flood judgment. The term for “floodwater” used in BD 175 is *hwḥw*, defined as a “primeval god” in Wb 3, 56:15, likely an alternate spelling for the Ogdoad member *hh*.

The Ogdoad in 20th dynasty Ramesside Letters

A collection of 50 papyri letters written in hieratic, and dated to the late Ramesside period (20th dynasty), has been collected and studied. The papyri come from the family archive of Djehutymose the scribe, and his son

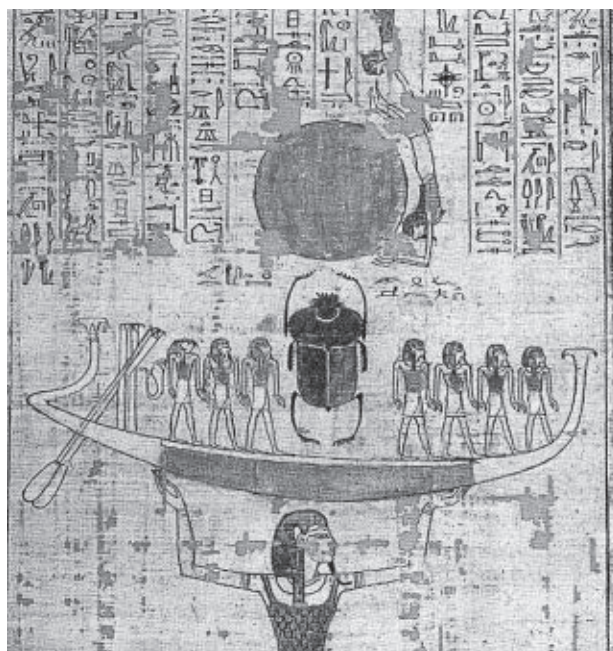


Figure 4. Nu supporting the solar bark containing seven deities and Re, in Wilkinson²¹



Figure 5. Top section of Piankhi stela Auguste Mariette (1821–1881)



Figure 6. Piankhi stela Ogdoad inscription, in Grimal²⁸



Figure 7. Named Ogdoad, Great Amun Hymn³⁴

Table 1. Ogdoad vocabulary in BD 175

Line #	Transliteration	Ogdoad allusion
16	<i>ḡr ntt irw.n.sn ḡḡw imnt</i>	"because they have caused harm to the <i>hidden</i> "
20	<i>nn nwi m-m nw n ḡḡ imnt.sn</i>	"I am not among those who caused harm to their <i>hidden</i> things"
27	<i>mḡ.ti sp sn kkwt.ti sp sn</i>	"when it is deep ... in <i>darkness</i> ..."
28	<i>ḡḡ.ti sp sn</i>	"and of <i>seeking</i> ..."
38	<i>m ḡnty ḡḡw</i>	"in the boat foremost of <i>millions</i> ."
48	<i>iw.k r ḡḡw n ḡḡw</i>	"You are to have <i>millions</i> of <i>millions</i> ."
49	<i>ḡ n ḡḡw</i>	"a lifespan of <i>millions</i> ."
52	<i>iw t pn r ii m nnw</i>	"and this land shall turn into <i>Nun</i> ."
53	<i>m ḡwhw mi tpy.f</i>	"As a <i>floodwater</i> , as its original condition."
62	<i>iw ir.n.i ḡry st.f n wi n ḡḡw</i>	"I have made him to bear his seat in the boat of <i>millions</i> ."

Table 2. Late Ramesside Letters (LRL) Ogdoad references²⁵

Ref.	Inscription
312.LRL No. 50	"... Amun, Holy of Place, and the great and [august] Ogdoad ..."
314.LRL No. 16	"... upon Amun of Djeme, upon Amun of the Throne(s) of the Two Lands, upon the great and august Ogdoad that rests in Kheftehinebos ..."
315.LRL No. 28	"... upon the great and august Ogdoad that rests [in] Kheftehinebos ..."
318.LRL No. 15	"... upon Khnum, who has fashioned the great and august Ogdoad that rests in the Promontory of Kheftehinebos ... and who made for them the hills in which you are, upon Amun of Djeme ..."

Butehamun, who were employed at Thebes, and who lived in Medinet Habu. The letters represent correspondences by the chief scribes of the necropolis to a certain individual for administrative purposes. The letters have been dated with some certainty to the reign of Ramses XI, between regnal years 1–19.²⁴ Of interest to this study are four letters referring to the Ogdoad as part of their lengthy introductory blessings and invocations (dated to regnal year 10), thereby representing an incidental written testimony to the association of Hermopolis (*Khemnw*) with the Ogdoad and their tomb. The letters which contain Ogdoad references (table 2) are: No. 15–Papyrus Phillipps; No. 16–Papyrus Turin 1971, and No. 28–Papyrus British Museum 10375; and No. 50–Papyrus Turin 2026.

Letters 15, 16, and 28 refer to the Ogdoad tomb in the phrase "who rest in Khefte-hi-nebos", meaning "opposite her lord", i.e. Medinet Habu. Letter No. 15 refers to the hills made for the Ogdoad, and "Amun of Djeme", representing the Ogdoad tomb.²⁶ An important observation regarding these Ramesside letters is that they possess an established tradition referring to the Ogdoad tomb at Djeme, Medinet

Habu during the 20th dynasty. The tomb of the Ogdoad referred to here will be discussed later in this article.

25th dynasty Victory Stela of Piankhi—testimony to Ogdoad worship

The Victory Stela of Piankhi, or Piye, an invading Nubian king who reigned from c. 753–723 BC during the 25th dynasty, makes reference to the temple of Hermopolis (*Khemnw*), where the Ogdoad were worshipped. The granite stela (figure 5) consists of 159 lines of text, including a description of Piankhi's victories over Egypt and Hermopolis, where he entered the Ogdoad temple to sacrifice. The inscription §13:1.58–60 (figure 6) states: "His majesty arose in splendor from his palace and proceeded to the temple of Thoth, lord of Khemennu. He sacrificed oxen, shorthorns, and fowl to his father Thoth, lord of Khemennu, and the Ogdoad in the temple of the Ogdoad."²⁷

The mention of the Ogdoad in the Piankhi stela is brief and does not name the group, but stands as a 25th dynasty textual witness to the worship of the Ogdoad at *Khemnw*, "Eight City".

City of the Eight, and the Ogdoad temple

El-Ashmunein is the Arabic name of a modern city in Upper Egypt, some 322 km south of Cairo which contains an archaeological site that marks a temple where the Ogdoad were worshipped. The El-Ashmunein site was marked by a Greco-Roman temple of Thoth, dedicated to the Ogdoad's worship, itself destroyed in modern times, but archaeological evidence has shown traces of 18th dynasty foundations laying beneath. Ashmunein is derived from the Coptic (Ⲭⲙⲏⲛ, *Shmun*) which means "City of the Eight", in memory of the Ogdoad. The Greeks called it by the name of Hermopolis Magna (after their god Hermes, whom they associated with the Egyptian god Thoth). The Egyptians knew it by the name *Khemnw* ("Eight City"). Spencer in an archaeological report states: "Of the very early temples of El-Ashmunein, no intelligible traces have survived, and any remains must lie deep below the present level of the subsoil water".²⁹ However, four colossal baboon statues were excavated at El-Ashmunein, bearing inscriptions to the 18th dynasty ruler Amenophis III, along with inscriptions to *Khemnw*. Spencer

notes Prof. Abu Bakr has argued for eight baboons originally, which would be consistent with the Ogdoad known from tradition, which likely guarded the temple where the Ogdoad were worshipped.³⁰ The evidence presented here is consistent with prediction 5, that Noah and his family were worshipped by the ancient Egyptians as deified ancestors, with their own accompanying temple.

Darius I, 27th dynasty Temple of Hibis and the Ogdoad

The temple of Hibis at the centre of the southern el-Khargeh Oasis is the greatest surviving Persian monument in Egypt,³¹ lavishly decorated throughout, from the reign of Darius I (cf. Daniel 5). Hibis Temple provides a near-complete expression of Late Period religion, which includes representations of approximately 700 deities in the sanctuary, including obscure deities in unusual forms.³² The most notable inscription is from the Great Amun Hymn, located on the south wall of the hypostyle hall, which depicts the Ogdoad as Nun, Nunet, Kek, Keket, and Gereh and Gerehet (figure 7), which represent the first occurrence of “night”, or “cessation” found in Egypt.³³ The Ogdoad names substitute for Amun and Amunete in a unique way.

The Ogdoad males are depicted here as frog-headed and their female consorts as serpent-headed, both animals associated with water and flooding. Other depictions of the Ogdoad at Hibis temple show them in simian form, as worshippers of the sun on the first day of creation.

18th dynasty Amun Temple—the Ogdoad tomb

Ptolemaic and Roman period traditions³⁵ as well as Ramesside letters state that small 18th dynasty temple to Amun (figure 9) was believed by the Egyptians to be the tomb of the Ogdoad. The temple is located at Medinet Habu, situated within the larger 20th dynasty Ramesside III temple complex (figure 8). Within the Amun chapel, the Ogdoad are named in the temple’s inscriptions with a unique set of compound names, specifically *Imn-Nwn* and *Imn.t-Nwn.t*, *Kk.w* and *Kk.t*, *Hh* and *Hh.t*, and *Niw* and *Niw.t*.³⁶ The Oriental Institute of the University of Chicago excavated at the site of Medinet Habu from 1926 to 1933³⁷, publishing 14 archaeological reports, with two further volumes by Breasted and Murnane.

Under the reign of Ptolemy VIII Euergetes II (died 116 BC), the entrance and bark shrine of the original 18th dynasty Amun temple from the times of Thutmose III, Horemheb, and Seti I, were re-carved in Ptolemaic style.³⁸ Images within the temple show Ptolemy VIII and Cleopatra II worshipping the Ogdoad. The Ogdoad are shown seated, in two anthropomorphic groups of four, all holding *Was*-sceptres, representing the pillars of the sky, devices used to support the cosmos from collapsing back to Nun (the Flood).

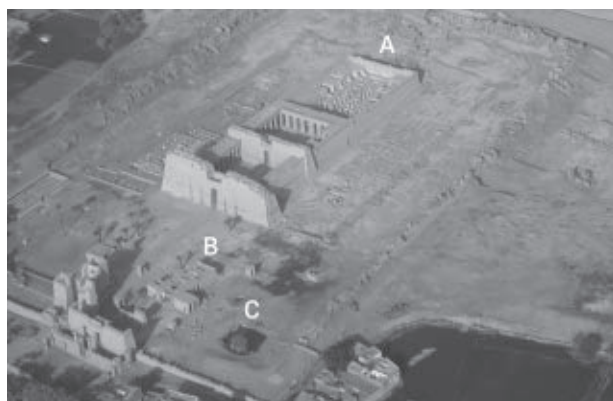


Image: Steve F-E-Cameron/CC BY 3.0

Figure 8. Ramesside III temple

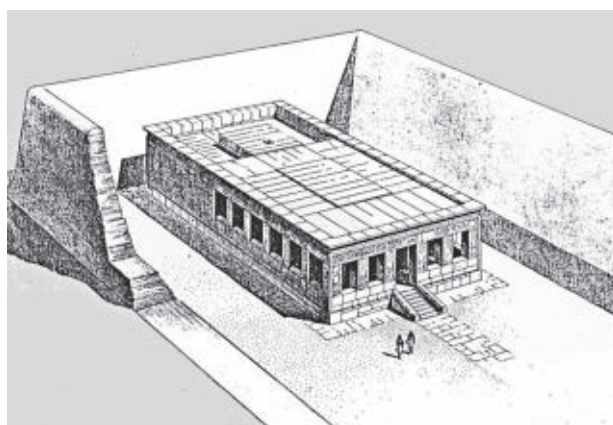


Figure 9. Reconstruction of 18th dynasty Temple Ogdoad tomb (by Hölscher)⁴⁰

An accompanying lengthy cosmological text inscribed on both door jams and lintel (figure 10), describes the role of the Ogdoad at creation, and their burial at Medinet Habu (Djeme), and has been described by McClain as ranking alongside the great Amun Hymn from Hibis.³⁹

From figure 8: (A) 20th dynasty Ramesses III temple; (B) 18th dynasty Amun Ogdoad tomb; (C) sacred lake representing the Nun, or primeval flood.

From figure 10: (A) Door lintel and jambs covered in hymns to the Ogdoad describing their burial within the Amun temple and their role in the Flood, showing the Ogdoad seated receiving offerings from Ptolemy VIII & Cleopatra; (B) bark shrine (room dedicated to the sun bark).

The text within the bark shrine contain striking references to the Flood and burial of the Ogdoad within the shrine itself:

“... the noble fathers who brought into being the beginning who shone in Nun when the land was in utter darkness and every existing thing was flooded ... who opened the light after the utter darkness when they brought Nun in his cloudburst ... (As for) the great elder one, even as he enlarged his mummy in the netherworld, so also he opened the inundation in its time in the presence of his father: it is Amun



Figure 10. Door to bark shrine showing Ptolemy VIII & Cleopatra II worshipping the Ogdoad⁴¹

Djeser-set, the father of fathers [who has gone forth from] Nun, who is therein along with the Ogdoad of the domain of Amun, the burial of all of (them) being completed therein, (namely) those who sleep at the mound of Djeme, the place of the father of the gods, who bore every god at the first occasion, interred in their wrappings, their members being within it, the mound of Djeme ...⁴²

McClain, within his archaeological report, published in 2011, states:

“As an expanded description of the purpose for the shrine’s renewal, these texts illuminate the characteristics of Amun, in particular as the father of the great elder one (Re) ... who ‘comes forth’ here at the mound of Djeme to receive funerary offerings We learn also of the cult of the Ogdoad, who ‘sleep at the mound of Djeme’, ‘interred in their wrappings, their members being within it’, and who declare that this mound of Djeme, the ‘resting-place of Amun’, is their funerary abode ... these texts declared unequivocally to be the locus of the mortuary cult for these ‘deceased’ creator deities.”⁴³

Several unidentified subterranean chambers discovered beneath the Amun temple, filled with dark sand and of unknown function, have been discovered. The possibility of finding more pits existing beneath the floors of other rooms within the temple has been left unresolved due to the desire not to disturb the ancient pavements in these rooms.⁴⁴ To date, no modern survey has been carried out to determine if there are older structures beneath the 18th dynasty temple dedicated to the Ogdoad tomb. What can be said is the Egyptians believed

the Ogdoad were buried here, but until an investigation can be made beneath the temple, the idea that Noah and his family are buried here will have to remain elusive.

Conclusion

From the biblical data outlined in part 1, 10 predictions were made, based upon the implications of Noah and his family living to vast ages as recorded in Genesis 9:29; 11:11. Their unique experiences in human history meant they would have likely been worshipped as deified ancestors by their pagan descendants. Scripture names Egypt after Noah’s son Ham and his son Mizraim which provides a specific search focus. With this in mind, the following predictions based on the implications of the biblical text were used as search criteria. Prediction 1: Noah and the Flood should be found in Egypt’s most ancient texts—which happen to be the 5th dynasty Pyramid Texts. Here two terms for the ‘Great Flood’ are to be found, along with the concept of “the Eight”—known from later Greek texts as the Ogdoad, or *Khemnw* in Egyptian. Two pairs are known from PT—*Nuw*, *Nuw.t* and *Amun*, *Amun.t*, with the other names *Kek* and *Heh* appearing as cosmological concepts. These names then appear in later collections of texts known as the Coffin Texts and the Book of the Dead. BD 175 notably contains a description of the Flood sent to destroy mankind, where these names appear within the text, possibly as a scribal play-on-words for the forces of chaos.

A group of eight gods connected with the Flood collectively known as the eight Heh gods, (chaos)—a name derived from the Ogdoad (who fulfil the identical function as the Ogdoad, in supporting the sky from collapsing back into the Nun)—appear in funerary inscriptions of Tutankhamun, Seti I, and Ramses II, III, and IV. The Ogdoad also had their own 18th dynasty worship centre, based at modern El-Ashmunein (derived from the Egyptian-Coptic for “Eight City”). And the Ogdoad were also believed by the Egyptians to be buried at the 18th dynasty Temple of Amun, at Medinet Habu.

These combined facts are consistent with the biblically based predictions set forth at the beginning of the first article, specifically:

- ‘Concepts of the Eight’ (No. 2);
- ‘Flood concepts’ (No. 3);
- ‘Deified ancestors’ (No. 5);
- ‘Pharaonic references’ (No. 6);
- ‘Temple and worship’ (No. 7), and;
- ‘Tomb of the Eight’ (No. 9).

The following predictions will be investigated in further articles:

- ‘Creation concepts’ (No. 4). If Ham brought with him pre-Flood knowledge, then there should be striking similarities between ancient Egyptian ideas of Creation compared to Genesis 1–4.

- ‘Egyptian vs Hebrew names’ (No. 8): paper 1 briefly demonstrated how the meanings of the names of Noah and his sons carry over into the meanings of the names of the Ogdoad. This will be further demonstrated in a separate article, which will further strengthen the overall case that the Egyptian Ogdoad represent polytheistic concepts of Noah, his family and the Flood.
- ‘Pioneer eponyms’ (No. 10): are there fundamental concepts, inventions or everyday items from ancient Egypt that were likely derived in memory of Noah, his family, and the Flood? If so, will they manifest themselves in recognizable ways? These questions will form the basis of further articles.

Acknowledgment

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Common examples of ‘one gene, one trait’ exposed

Jerry Bergman

I taught college level human genetics and was chagrined to learn that the textbook/workbook I used for a decade until 2017¹ incorrectly claimed the older, now-refuted, view that common examples of traits were produced by a single gene was valid. A number of claimed examples were researched, finding the expression of all of them were influenced by many genes. Of these examples, 10 were selected and summarized. This finding supports the fact that to produce new traits, even seemingly simple ones, requires several genes as a set, increasing the complexity significantly and reducing the likelihood of producing these new traits by random changes in the genotype as postulated by evolution.

High school and college biology students are often taught that many basic human traits are examples of simple one-gene regulation.² This is reflected in common statements, such as “twenty thousand years later, another mutation allowed the hair on our heads to (unlike monkey hair or body hair) grow indefinitely long—a haircut gene”.³ The genetics workbook used at the college where I taught, besides the examples discussed below, included the shape of the face, the hair curl, eyebrow size and shape, eyelash length, tongue folding, and others for a total of 27 examples.¹ A review completed for this paper found that many traits long assumed to be a result of a single mutation, or a single gene, have turned out to be produced by numerous genes.

In studying factors that produce specific nose appearances, scientists have so far identified 14 different facial traits from analyzing about 6,000 photographs. Two genes were linked to nostril shape (GLI3 and PAX1), one (RUNX2) affected the bridge, and the DCHS2 gene was found to influence how far the nose extends outward, and the tip angle.⁴ No doubt others also exist. McDonald concluded, “It is an embarrassment to the field of biology education that textbooks and lab manuals continue to perpetuate these myths” of one gene-one trait, even today.⁵

The significance for evolution of the ‘one gene producing one protein or one trait’ argument can be easily explained by William Paley’s classic watch example. A wind-up watch has hundreds of parts, all of which function as part of an interconnected unit. If any one part in the movement mechanism is removed, the watch will not function properly or, most likely, will not function at all. The only exception may be the complete movement mechanism which is often held together by four to six screws and, if one is removed, it may still function, but the snugness in the area where the screw was removed, even if minor, may cause a slight sloppiness that could eventually cause uneven wear and

less accurate time, leading to significant inaccuracies and, eventually, failure.

Likewise, if most genetic functions are controlled by several genes, a mutation, even if it improves some aspect of the organism, will likely have an adverse effect on some other part of the living system because, like the watch, all of the parts function together as a unit with many, or at least several, other genes and even gene systems.

Furthermore, the concept of what defines a single gene has now been blurred by unexpected genetic complexity, such as the fact that differential splicing of introns can produce many different proteins from one gene transcript.⁶ The classic view of the genome, that protein-producing genes are distinct segments of DNA transcribed into one mRNA and in one direction, has now been overthrown. It is now recognized that multiple and overlapping genes often occupy a single strip of DNA that produces several functional mRNAs.⁷ An estimated 94% of human genes generate more than one product by alternative splicing, producing proteins with sometimes dramatically different functions, despite being produced from the same gene.⁸

This fact is solace to those disappointed by the small number of genes in the human genome: humans have roughly the same number of genes as *Caenorhabditis elegans*, a small transparent worm. A homologue of the human gene Dscam (Downs Syndrome Cell Adhesion Molecule) as expressed in *Drosophila melanogaster*, produces 95 alternative spliced exons and 38,000 possible isoforms.⁹ In comparison, the entire *Drosophila melanogaster* genome contains only 15,016 genes. This fact allows us a glimpse of the complex interconnectivity of the genome.

University of Delaware Genetics Professor John McDonald has documented 20 examples, including arm folding, asparagus urine, beeturia, cheek dimples, hair whorl, and toe length, that were commonly used to teach the one gene-one trait concept in high school and college genetics

classes.¹⁰ A literature search was completed on the 10 most common examples of the one gene-one trait claim, selected according to my experience teaching college-level genetics. The review found the 10 most common examples of the one gene-one trait myth used in textbooks were controlled by numerous genes.

Some refutations of the one-gene control system

Eye colour

A common example is the genetic control of eye colour, actually the colour of the iris diaphragm which controls the amount of light allowed to enter the eye. Its function is protection.¹¹ For example, light-blue eyes cause visual problems because the lack of brown pigment on the iris diaphragm does not fully protect the retina against the adverse effects of excess bright light.¹² Iris colour is determined primarily by the ratio of eumelanin, which produces a dark-brown colour, and pheomelanin, which produces a reddish colour. Also important is how melanin is distributed on the iris.¹³

The common iris colour categories are blue, green, hazel, and brown. A more detailed analysis has produced at least nine hue and saturation values, which are: (i) light blue; (ii) darker blue; (iii) blue with brown peri-pupillary ring; (iv) green; (v) green with brown iris ring; (vi) peripheral green central brown; (vii) brown with some peripheral green; (viii) brown; and, (ix) dark brown.¹⁴ This more complete category obviously requires far more genetic input than the traditional two genes, which is what genetic research has found. Furthermore, eye colour can also change, especially during early childhood.¹⁵ The two main genes involved in colour variation are *HERC2* and *OCA2* genes, located next to each other on chromosome 15, but at least 10 other genes, and the complicated interactions between them, also influence eye colour.¹³

Earlobe attachment

A common genetics classroom exercise is to examine each other's earlobe type and determine how many had attached versus unattached or free earlobes. Attached earlobes blend in with the side of the head, and unattached earlobes have hanging lobes that can dangle. Usually, many more students have unattached than attached earlobes.

The Mendelian claim is this trait is due to a dominant-recessive dichotomy. In this case, the claim is that the free earlobe trait is dominant and the attached is recessive.¹⁶ The attached-free variant is used as an example of a classic single-gene recessive trait, an explanation that implies genetic

control is relatively simple.¹⁷ In fact, earlobes do not fall into two categories, rather there are continuous variations in attachment points, from up near the ear cartilage to well below the ear.¹⁸

This observation caused biologists to question this oversimplified paradigm even before modern genomics. As early as 1937, one anatomist suggested that earlobe attachment may be a multi-gene trait.¹⁹ One new earlobe genetics study analyzed DNA sequences and earlobe measurements from 74,660 people, including those of European, Latin American, and Asian ancestry. By associating DNA sequences across the genome with ear development patterns, the researchers identified 49 genomic regions related to earlobe-attachment design. They also sequenced the products of genes activated during ear development, confirming that the different genes discovered in their DNA trait study were located among many regions in the genome. The authors of the paper concluded: "These genes provide insight into the complex biology of ear development."²⁰

As expected, the genetics behind these variations are complicated but not a research priority because, as far as is known, earlobe variations are unrelated to disease causation.²¹ In short, it is a "myth ... that earlobes can be divided into two clear categories, free and attached, and that a single gene controls the trait, with the allele for free earlobes being dominant".²² Modern research techniques have now confirmed that "even the concept of what clearly defines a single gene is blurred by unimaginable and unexpected complexity".²³

Hair colour

Another common example of the one-gene myth is that red hair is determined by a single recessive red allele. Most studies divide hair colour into four discrete colours, namely blond, red, brown, and black. As is true of eye colour, hair colour is also determined by the amount of eumelanin (dark-brown colour) and pheomelanin (a reddish colour) in the hair shaft. The amount of eumelanin ranges from very little, producing light-blond hair, to relatively large amounts, producing jet black hair. In addition, people with large amounts of pheomelanin have red hair, which ranges from pale red ('strawberry blonde') to bright red and reddish-brown.²⁴

Because light level variations and colour hue differences can affect viewers' perceptions of hair colour, Reed used a reflectance spectrophotometer to measure the light levels reflected by hair at different wavelengths in persons labelled as redheads.²⁵ He found no evidence of a clear separation of hair into two categories. Instead, intermediate colours were noted that could not easily be classified as, for example, red or non-red. The three most common amino acid

polymorphisms associated with red hair are R151C, R160W, and D294H, indicating that many more genes are involved in other hair shades.²⁶

Skin colour

Human genetics studies have debunked the belief that skin colour is controlled by only a few major genes.²⁷ Several studies have utilized human subjects from the continent with the largest spectrum of skin colour diversity in the world, namely Africa. One study found that six major genes contributed only 30% of the total skin-colour variability,²⁸ and numerous other genes were responsible for the other 70% contribution. In another study, researchers found a total of 15 different genes that make major contributions to skin colour.²⁹

Hitchhiker's thumb

'Hitchhiker's thumb' is the ability to bend the thumb significantly backwards to produce a large angle between the two bone segments (figure 1). The claim is that there are two kinds of thumbs—straight, where one cannot bend it backwards (dominant) and hitchhiker's thumb (recessive), a trait controlled by a single gene with two alleles. This idea was proposed by Glass and Kistler³⁰ in 1953, and the claim, which could have easily been evaluated in a large classroom of students, has been widely repeated by teachers since then.

At least two studies have falsified this myth. Harris and Joseph³¹ used X-rays of 294 individuals to accurately measure the angle between the first and second bones of the thumb. Their analysis found a continuous distribution, and that most individuals had intermediate values, not a dichotomy as described in the myth. A similar study using a protractor held against the outside of the thumb to measure

the thumb angle obtained a normal bell curve.³² Although hitchhiker's thumb is often used to demonstrate Mendelian genetics, the extant data falsify the claim: thumbs don't fall into two discrete categories, and the trait is not controlled by a single gene.

PTC tasting

Small amounts of the compounds phenylthiocarbamide (PTC) or propylthiouracil (PTU) impregnated in paper strips are tasted by students to determine if the taste is very bitter or, for non-tasters, the only taste is the paper itself. I have used the test with hundreds of students when teaching a wide variety of science classes. The idea came from Du Pont chemist A.L. Fox, working with phenylthiocarbamide when a colleague complained about the bitter taste of the chemical dust.³³ Fox insisted it was tasteless so he asked his colleagues to taste the PTC, discovering that for some people it had a strong bitter taste, and others found it tasteless.³⁴

Guo and Reed reviewed the PTC-tasting subject, citing 392 references. They concluded that how the test is administered makes a big difference in the results.³⁵ Early studies put PTC crystals directly on the tongue while others used solutions of PTC, or paper soaked in PTC, which is then dried.³⁶ When this factor is controlled, some people would be classified as tasters with one technique and non-tasters with the different technique.³⁷ Genetic analysis found linkage to DNA polymorphisms in 26 large families and much of the variation in PTC tasting was associated with chromosome 7 and a variation in chromosome 16, indicating several genes are involved.³⁸

The common myth is the claim that only two kinds of people exist—tasters and non-tasters. The myth is that the



Figure 1. A Hitchhiker's Thumb



Figure 2. Example of tongue rolling

taster trait is controlled by a single gene which is dominant over the allele for non-tasting. The fact is, after “almost 70 years, the origins of that variability, apparently due in large part to genetic factors, remains a conundrum”.³⁹

Tongue rolling

Some people can easily roll their tongue into a small tube (figure 2) while others can't. This is one of the most common traits that biology teachers use to demonstrate basic genetic principles that can easily be tested. The trait is attributed to *Drosophila* genetics pioneer Alfred Sturtevant's description of tongue rolling as a simple two-allele trait with the allele for rolling dominant, and non-rolling recessive.⁴⁰

It has now been determined that the tongue-rolling skill is often not genetic, but learned. The fact that some people learn to roll their tongues after first being unable to is evidence that this trait is not the result of a simple genetic character as previously believed. Further evidence that the trait is not genetic is the finding that identical twins can have discordant tongue-rolling abilities.⁴¹ The proportion of people who learn to roll their tongue ranges from 65 to 81%, and a slightly higher proportion of tongue rollers exists in females.⁴²

The skill also exists on a continuum. Some people can only roll their tongue's edges slightly and cannot consistently be classified as rollers or non-rollers.⁴³ Even though numerous studies have shown that the skill is not genetic, but largely learned, tongue rolling remains a popular test for Mendelian genetics.⁴⁴ In short, the tongue-rolling myth has been debunked.

Widow's peak

Some people have a prominent V-shaped point at the centre front of their hairline called a widow's peak (figure 3), in contrast to a hairline that goes straight across. The allele for widow's peak is said to be dominant over the allele for straight hairline. Major problems with this claim include ambiguities about who has a widow's peak. Hairlines exist on a continuum requiring imprecise judgments to make this determination. One study of male medical students concluded that only 32 out of 1,039, or 3%, had a “slight but noticeable” widow's peak.⁴⁵ Another study of 360 women concluded 81% had a widow's peak.⁴⁶

The problem of age also has to be considered. The hairline of many men and some women recedes over time, often more slowly in the middle, producing the widow's peak. It thus may be very difficult to distinguish between a receding hairline and a true widow's peak in adult men. The problem with the widow's peak example used to illustrate the basic genetics is the myth that it is controlled by one gene with two alleles, yet researchers have been unable to locate these genes. McDonald states he does not know how the myth



Image: Kihond/CC BY-SA 4.0

Figure 3. A prominent V-shaped point at the centre front of the hairline known as a widow's peak

began nor any experimental evidence that supports it in spite of a careful search of the scientific literature.⁴⁷

Hand clasping

Most people have a strong preference for clasping their hands either with the left thumb on top or the right thumb on top. It also feels very unnatural to clasp the hands in the opposite way than one normally does. In one study roughly half of the people studied were right thumb on top and the other half were left thumb on top.⁴⁸ Since the first study on this topic was done over a century ago, no clear evidence has been found that supports the hand-clasping preference that fits the dominant-recessive myth.⁴⁹

A review of nearly 100 publications that have surveyed hand-clasping frequencies in populations around the world found most populations had between 40 and 75% left on top and no preference for either was about 1%.⁵⁰ One hypothesis suggested left-handed persons, when folding their hands, strongly tended to put their left thumb on top



Image: JohnN/CC BY-SA 4.0

Figure 4. Young man with a cleft chin

and right-handed persons their right thumb on top.⁵¹ Another hypothesis holds that preferences are probably chosen by each individual as a young child and reinforced over many years until the opposite thumb feels unnatural. No evidence has indicated the trait is genetic.

Cleft chin

Some people have a prominent dimple or crease in the chin's front called a cleft chin (figure 4). The claim is this trait is controlled by a single gene with two alleles, called the dominant cleft chin and recessive smooth-chin trait. The little genetic data available does not support this claim.⁵² A major problem is that many chins are intermediate between cleft and smooth, and chins come in a variety of shapes, including round, dimples, vertical, and Y-shaped furrows.⁵³ Furthermore, a significant increase in cleft chin occurs with age; about 5% of boys 6 to 10 years old have cleft chins, while 10% of men over age 35 have a cleft chin. This change with age is also evidence against the simple genetic model. Weight gain and loss also influences the cleft chin trait.

Summary

The oversimplified evolutionary paradigm that evolutionists use to justify their worldview is not supported by human genome studies that consistently show much greater levels of complexity in producing these and other traits than once assumed. Actually, very few traits are the result of simple gene pairs, and, as more genetic information becomes available, the number of different genes that determine most features usually increases. Seemingly simple traits turn out to be very complex due to the genetic network interconnectivity of functioning in complex dynamic systems throughout the genome.

Applying the findings of this review of the one gene-one protein theory to the 2017 Gershoni and Pietrokovski study identifying 6,500 genes that produce human sexual dimorphism (and are, therefore, expressed differently in men and women), the results are not unexpected. Many of the traits which define sexual dimorphism that were long assumed to follow this one gene-one trait rule in fact do not follow it.⁵⁴ Consequently, the 20 major traits that are believed to make up human sexual dimorphism may actually be determined by several hundred genes, not 20. Another factor is genetic pleiotropy, the situation where one gene influences two or more, often many more, seemingly unrelated phenotypic traits.⁵⁵

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The conventionality thesis and biblical creation

John Hartnett

A concise introduction to the conventionality thesis on the synchronization of clocks separated by distance is presented and how it may help biblical creationists explain distant starlight. It incorporates answers to several questions and objections to this topic. Although Special Relativity is counterintuitive, it is a very good theory for explaining the current world. A correct understanding of the conventionality thesis (which is intrinsic to Special Relativity) enables us to observe the universe in real time. The conventionality thesis is consistent with all known physics. From it we can conclude that the age of the universe, and the stars within it, are only about 6,000 years old.

This topic is important for biblical creation because it permits a very clear explanation for the creationist starlight travel time problem. The discussion here follows on from my review of Jason Lisle's recent book *The Physics of Einstein*.^{1,2}

The conventionality thesis

The historical development of the *conventionality thesis on the synchronization of clocks separated by distance* (hereafter referred to as the *conventionality thesis*) is outlined and discussed in the book *Concepts of Simultaneity* by Max Jammer (figure 1).³ Jammer starts with the Greek philosophers and works through to the modern age—with concepts and ideas presented by philosophers and physicists. In regard to the concept of simultaneity, the most significant developments occurred in the past 110 years, starting with Albert Einstein when he published his famous paper on Special Relativity in 1905.

Time is intrinsically linked with *simultaneity*. Simultaneity involves how we might synchronize distant clocks with our own local clocks. This issue then has an enormous bearing on some significant philosophical questions. How do we measure the speed of light coming from the distant cosmos? How old is the universe? How do we know how old the universe is?

We accept as a true property of the universe, and consider it to be empirically verified, something that is actually not empirical but has the nature of a convention chosen for doing science. I explain below. But this incorrectly held notion has led to the idea that we can definitively know how old the universe is. Since we measure the speed of light as finite (not infinite) and the universe is enormously large, it is concluded that it must have taken light billions of years to travel to Earth from the distant cosmos. From that, both theists and atheists have incorrectly concluded that the biblical timeline cannot

be correct. Atheists even use this as an argument against the existence of the Creator.

In classical (Newtonian) physics, up to several hundred years before Einstein and before any measurement of the speed of light, a distant event was considered simultaneous with a local event if the local observer saw them occur at the same time, as measured by his local clock. This is because the speed of light was assumed to be infinite. There was no delay between the light leaving its source and its reception at the observer. But that all changed.

The speed of light, designated by the letter *c*, was measured from the late 17th century into the 20th century many times, and by different methods and different observers. The results agreed at about 300,000 km/s. This means that all signals that carry information in the universe are limited to travelling at this speed, at most. However, it was not until Einstein in 1905 that the full ramifications of the speed of light being a limiting speed began to be understood.

Einstein and Special Relativity

Starting with his famous 1905 paper on the theory of Special Relativity, Einstein made the significant discovery that underlines the importance of the concept of simultaneity.

He considered three principles: (1) the *relativity principle*—where the physics is the same for all inertial⁴ observers; (2) the *principle of the constancy of the speed of light* regardless of the uniform speed of the observer⁵; and (3) the *transformation equations*, which up until that time were the *Galilean equations*, which were used in classical Newtonian mechanics.

But Einstein pointed out that these three are incompatible. Experiments confirmed (1) but also confirmed that the equations of electrodynamics or optics are *not* invariant in transition from one inertial system to another under the transformation equations (3). Thus the relativity principle (1)

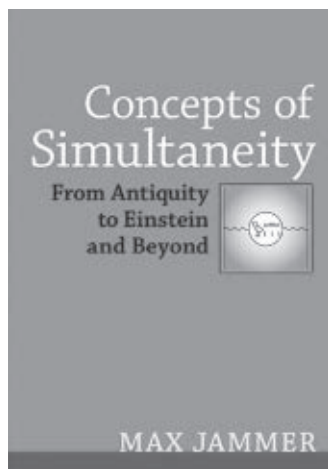


Figure 1. In his book, Max Jammer outlines the historical development of the conventionality thesis.

was in conflict with (3). For example, a moving source should add its speed to the measured speed of light. If a laser light was seen coming from the back of a spaceship speeding away, at speed v , from an Earth observer the speed of the light beam coming from the back of the spaceship, according to (3), should be the speed $c - v$, but for a light beam shining out in front of the spaceship it should

be $c + v$, due to the added speed of the spaceship.

Einstein rejected (3) in favour of (2) and his Special Relativity theory was born. This meant a major revision of the concepts of time and simultaneity, in regard to the equations that govern the time we measure on clocks. It also meant different transformation equations were required. By using the *Lorentz transformations* Einstein was able to develop a consistent theory. From that theory strange effects like time dilation and length contraction were predicted, and many experiments since have established them as experimental facts.

Einstein said in 1905:

“We have to bear in mind that all our propositions involving time are always propositions about simultaneous events.”⁶

How do we know events are simultaneous? If they occur in the same location they can easily be seen to be simultaneous by the fact they both occur at the same time, measured by the same clock. Only one clock is involved. But if the events are not both local, but one is distant, then only by sending a light signal from one to the other can one ascertain their simultaneity. This means there are two clocks—one distant and the other local.

To determine the time on the distant clock when the event occurred there one needs to synchronize the distant clock (A) with a local clock (B). If the speed of light was infinite there would be no problem, because what you see is what you get. But if the speed of light *one way* from clock A to clock B is not infinite, what is it? You would need to measure this one-way speed of light. If you knew what it is you could make an allowance for the difference in times showing on the distant clock A compared to the local clock B. *So to synchronize these clocks*, in order that you might know if a distant event is simultaneous with a local event,

you need to know the one-way speed of light. But here is the problem. *To measure the one-way speed of light you need synchronized clocks separated by a distance.* That is, you need to know the time of flight of the light from A to B and with the distance calculate the one-way speed.⁷ It is totally circular reasoning, which Einstein recognized.

Einstein simply chose as his method of clock synchronization that which most simplified his equations of Special Relativity—the standard clock synchronization method,⁸ which means the speed of light one way in any direction is the same (or isotropic) and equal to c . He had no empirical reason to choose that, but like most theorists, symmetry and simplicity are sufficient reason.

This means the choice of the one-way speed is *conventional*, i.e. based upon an arbitrarily chosen convention, and not an empirically measured fact. This is the *conventionality thesis* on the synchronization of clocks separated by distance.

The conventionality thesis has been debated vigorously in the scientific literature, mostly amongst philosophers of physics, who have come up with proposals in an effort to refute it. But they have been met each time by others who have exposed their errors. Most often it has meant that somewhere in their proposal they have implicitly *assumed* the isotropic speed of the light, hence the standard synchronization method.

This debate has taken place mostly since the 1950s, yet no one has produced a method to either measure the one-way speed of light or to refute the conventionality thesis. Of course, just by measuring the one-way speed of light one would refute the conventionality thesis.

We may conclude that the conventionality thesis is correct and that the assumption that the one-way speed of light is isotropic, i.e. is always c in whatever direction, is just that—the subject of a convention, a choice, and not something empirical. That means it is not discoverable by science. The universe cannot tell us the one-way speed of light and as a result it is impossible to synchronize distant clocks with local clocks *apart from a choice of a convention*.

The ramifications of this are significant. And it turns out that no choice of any particular clock synchrony convention, hence of the one-way speed of light, can have any bearing on any physics. The physics is the same under any chosen synchrony convention. Thus there can be no experiment that can refute the conventionality thesis.

What has this to do with biblical creation?

Just about everything! I believe it comes down to the same issues addressed by biblical creationists in regards to epistemology and the origin, not only of Earth and the solar system and life on Earth, but also of the whole universe.

How do we know what happened in the past? Can we directly see past events while they are occurring? No, we cannot! We live in the present. The past is gone forever. We cannot see dinosaurs allegedly evolving into birds. We cannot see anything living in the past. Dinosaur fossils are real enough but they are non-living stone and we see them in the present. In some cases, though, some biological material has been discovered, which makes you think they could not be 65 million years old.

However, my main point here is that we have no access to the past. No scientific experiment can tell us how old the rocks or fossils are. No time machines exist! We cannot see the solar system and Earth while it is being formed. We can only know for certain what happened from the history book God has given us.

I used to believe that it was different in the cosmos—that we could in principle even look back to Creation Week—but the same goes for the stars and galaxies. I had incorrectly been assuming an isotropic, one-way speed of light, which meant the universe seemed to be 10 billion years old,⁹ even though I believed the Earth/solar system was only about 6,000 years old. I now see how mistaken I was.

We cannot know the one-way speed of the light from the distant cosmos, or from anywhere else. So we cannot know by scientific measurement how long light from the distant galaxies has taken to reach Earth. It is just not possible by scientific measurement.

Now this may surprise you. But since the one-way speed of light is conventional, it can be chosen as any value between $\frac{1}{2}c$ and infinity. The limits of this range are imposed by causality. The essential requirement is that any round-trip value of the speed of light must average to c . This is the value that has always been measured. (So if one way is infinite, the

return one-way speed must be $\frac{1}{2}c$.) That is, it is only possible to measure the speed of light by reflecting it back from a mirror (figure 2) or by using another device which responds and sends the signal back. This is then a *two-way speed measurement* which is what all measurements have ever been.

Thus we can choose an infinite speed for light coming to Earth from the cosmos, i.e. one way. This means all clocks in the universe are *chosen* as showing the same time as Earth clocks. So if only about 6,000 years have passed for Earth clocks since creation then the same is true for cosmic clocks. This is a matter of convention, and not a matter of empirical measurement.

The argument can be made that the language of the Bible supports the choice of such a convention.^{2,10} We see everything in the universe *now*, not in the past. This claim is not refutable as it is not subject to empirical measurement.

The conventionality thesis has over 100 years of support in the scientific literature. It has been hotly debated but it has never been refuted. Even at the present time the debate continues with proposals to measure the one-way speed of light but none have successfully devised a method. In the conclusion of his book Max Jammer writes:

“... the question of whether the thesis of the conventionality of the concept of distant simultaneity is correct has not yet reached a final or generally accepted satisfactory solution.”¹¹

Maybe it will never be finally settled.¹² Possibly it is one of those mysteries of the universe that we are never going to get a definitive answer to. In the same way we will never be able to measure the one-way speed of light, as unsatisfactory as that may seem.

The scientific and philosophical arguments have not been in defence of the biblical age of the universe. They have

been made solely on the basis of the physics, epistemology, and ontology. However, based on the Scriptures, the universe is about 6,000 years old. And biblical creationists are free to choose a convention that agrees with this biblical timescale. In this way, the conventionality thesis and the anisotropic synchrony convention for the one-way speed of light (ASC)¹³ offer a biblical creationist explanation for how light from the most distant sources in the cosmos has reached Earth in the 6,000 years since the creation, as determined from a straightforward reading of the Genesis account.

In this understanding, there is no conflict with the true age of the

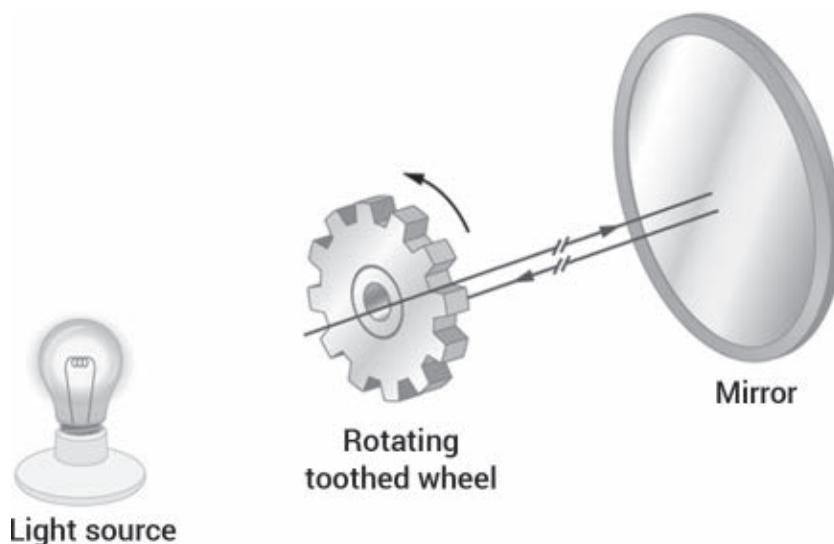


Figure 2. Typical method for the measurement of the round-trip speed of light

universe because it is simply counted off by the years since creation.^{1,2,14,15} The conventionality thesis thus supports the young universe biblical creation interpretation of the history in Genesis.

Questions on the conventionality thesis—our innate bias

Last year I had the opportunity to share an illustrated talk titled “Can we see into the past?”¹⁶ with a small group of friends who were all solidly biblical creationist in worldview. After I gave the presentation some questions were asked and one person, who does have some science training, said that he just could not get his head around it. I respect that but I believe it is a case where a little knowledge can be dangerous. In some cases a prior knowledge has led to a closely held belief, or an innate bias, which in turn can close off a person’s mind to new ideas without any logical reason. Such situations are well documented in the history of science, particularly in fields that are undergoing revolutionary transitions. For example, the case of phlogiston.¹⁷

Another man in that small group, who is blind and could not see my slides (so he did not have the advantage that the sighted people did), said that he had no problem understanding it. He said that he’d had no science education and did not have any preconceived ideas (for example that the one-way speed of light must be finite, isotropic, and equal to c , the measured two-way speed).

From such discussions, I’ve come to think that the issue relates not so much to the science but to the mindset of the hearer when the topic is discussed. There seems to be in many of us an innate bias against accepting that the events (in light from stars, galaxies etc.) we see in the cosmos are the same age as Earth and the solar system. The idea is that all we see in the cosmos is occurring *now*, and not in some past epoch of time. However, due to our education, among other factors, we are biased into believing that the starlight coming from the cosmos travels at a fixed speed of about 300,000 km/s, and so, because of the distances involved it must have taken billions of years to reach Earth. We believe this even though this one-way speed has never been measured.¹⁸

When I made my talk available on my own website,¹⁵ various readers commented, with some that were very positive and indicated clarity of understanding. Most of the comments and questions indicating an opposing stance revolved around notions that involve an implicit assumption that the speed of light one-way must be the same in all directions and equal to c , the measured round-trip speed. There is that innate bias.

I am not blaming or criticizing anyone for holding onto old ideas as we are all subject to these biases. But this type of thing, really a psychological issue, has actually impeded the

progress of science at different times. Because some notion has been believed to be true the real truth has been ridiculed, overlooked, or de-emphasized.

“All truth passes through three stages. First, it is ridiculed. Second, it is violently opposed. Third, it is accepted as being self-evident.”—Arthur Schopenhauer, German philosopher (1788–1860)³

If we take our lead from the biblical account, the natural language it uses suggests that the creation of the stars occurred in real time (Genesis 1:16–18). Thus what we see in the cosmos is happening now. A choice of the one-way speed of light from the ASC is consistent with this. Biblical creationists need to remain open to this possibility. Hopefully the following may help them to overcome any bias they may have against it.

Counterintuitive thinking

Some have said an anisotropic speed of light is an impossible situation, counterintuitive they say. But the problem is that what happens in the physical world is what it is. It does not depend on our personal preferences. There are several areas in physics which have this same problem, i.e. they have some counterintuitive aspect.

One famous area is Young’s double-slit experiment in particle physics. Electrons are shot at a screen with two holes, and an interference pattern is recorded on a screen behind the holes (similar to the bottom image in figure 3 where molecules were used). If one *does not* ‘look’ at which hole any individual electron passes through, by means of a detector near a hole, then one gets an interference pattern that suggests each electron *passed through both holes*. But if one ‘looks’ at which hole they pass through one gets an interference pattern that suggests each electron went through only one hole. The suggested explanations are various in quantum mechanics but there is no definitive resolution. But this is very counterintuitive. Why should looking for the hole that the electron passed through change the pattern? And how can one electron pass through two holes at the same time?

The problem is not resolved by saying some electrons go through one hole and some through the other, resulting in a situation where interference of the wave functions¹⁹ one with another occurs. The reason this is not the solution is that the experiment has been performed with emission of single electrons. After one electron has hit the screen another is emitted from the source and you still get the inference pattern as if the only electron passed through both holes simultaneously. To suggest that it was separate electrons interfering with each other you would have to say that each electron travels back in time to interfere with the previous one.

This problem is highlighted by the standard philosophy of quantum mechanics, which can be best illustrated by the

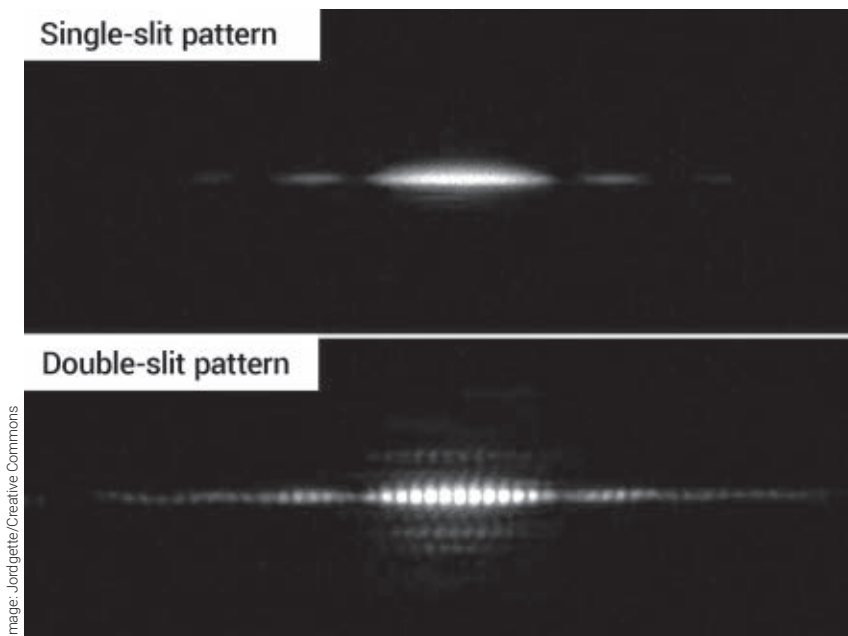


Figure 3. Patterns formed by large molecules in a Young's double slit experiment. The top image results from a single slit. The bottom image is produced when a double slit apparatus is used. From the bottom image, it is impossible to know which slit the molecule is passing through. But if we treat each slit individually, two single-slit patterns, one from each slit, are produced.

analogy that my physics professor gave in my introductory class on quantum physics. He said: "If a tree falls down in the forest does it make a noise if there is no one there to hear it?" The correct answer is that *you cannot ask the question*. Talk about counterintuitive.

Special Relativity (SR) is not intuitive either. It's quite the opposite. Depending on which synchrony convention (hence which value for the one-way speed of light) you choose you will determine a different age (based in the light travel time), not only of the universe, but also for any object in it. Based on ESC, the standard synchrony convention with one-way speed of light equal to c , i.e. isotropic, and Earth's motion around the sun, one would determine the age of a celestial object, like a galaxy, for example, to be greatly different when determined at two different times of Earth's orbit, 6 months apart. This is because Earth would be moving towards the object for one measurement and away from it for the second, as Earth traverses the sun in its annual orbit. Opposite directions change the sign of the Doppler term used to calculate time dilation. This means the calculation of the age of the object will be quite significantly different. But under the ASC there is no difference in age as it does not depend on motion of the observer on Earth but only on the distance to the object.

So in this case it is not the ASC that is counterintuitive. The ESC (Einstein Synchrony Convention), the standard synchrony convention, is counterintuitive.

An arbitrary choice

Is the choice of one-way speed of light 'ad hoc' or arbitrary? Every observer may choose the one-way speed of light to be some value between $\frac{1}{2}c$ and infinity, but with the proviso that the round-trip speed average to the canonical speed, c . That is essential because that is the only measurement we can make. I know this sounds rather arbitrary but the choice is restricted within some definite range. And this applies to all possible synchrony convention choices. So the standard convention (ESC) is just as arbitrary as the ASC in that regard. You cannot say one is an arbitrary choice and the other is not.

But if you are looking for an absolute fundamental property of this created universe that you could say means that the one-way speed is such and such or even is equal to the

canonical speed c , then that just cannot happen. It seems that this is due to the very nature of the physical creation. This is more than a convenient phenomenology. It has its substance in the very creation itself. It seems that this is another case where *you cannot ask the question*.

Some have argued, and I have read this on atheist discussion sites, that creationists are just using the one-way speed of light argument as a sort of 'loophole' that solves their starlight travel time problem. I would argue that this is not an applicable accusation, because it applies to any choice of the one-way speed, including the standard convention. We simply cannot know what it is. It is not really something we *can* know. So to say light from the stars actually took 10 billion years to reach Earth is not based on science but is an assumption. All a biblical creationist is doing is saying that he reads in the Bible that the universe is only about 6,000 years old and that accords with the light arriving from the cosmos instantly or near-instantly under a non-standard synchrony convention. So what SR has shown us is that we can simply believe what the ancients have always thought when they read the Bible and applied it to the stars, though they had no knowledge of their distances. Now that we know these it changes nothing.

The reason I do not like the use of the term 'ad hoc' applied to the ASC is because it implies the choice is totally free. But it is not. As explained above, any choice of the one-way speed has rules connected with it. One of those is due to *causality*, which requires that the one-way speed of light

can only take a value between $\frac{1}{2}c$ and infinity, i.e. never less than $\frac{1}{2}c$. However, whenever we measure or calculate some value for a physical measurable, like energy or momentum of a photon, we will always use the two-way value, c . This is a universal constant and nothing in this changes that. All physics remains unchanged. The only difference is to understand that the universe tells us nothing about the one-way speed of light and it is perfectly acceptable to choose its value within the specified range.

We cannot have *absolute* knowledge of a photon's one-way speed. Why does a photon always travel at the speed c regardless of the motion of the observer? This is what Einstein postulated (or stipulated) in his principle (2) (see above) upon which he founded Special Relativity theory. Einstein postulated that the speed of light, one-way in this case, was independent of the motion of the observer (v). It was not $c + v$ or $c - v$ in any thought experiment. This was counterintuitive at that time and it took 30 or 40 years for scientists to come to accept it.

But of course we cannot measure the one-way speed and it is only by first assuming that the speed is isotropic that any measurement of the speed of light could be related to this. Regardless of his own speed, an observer always measures the same speed for any photons, but it is always the two-way speed of light, the constant value that we call the canonical speed c .

Not only that, it is not possible to make any statement one way or another (pun intended) about any choice of the one-way speed, otherwise all we are doing is *begging the question*. I know this is frustrating but this is the nature of the creation we are to work with.

We cannot measure the one-way speed of the photons coming from the stars or even in the lab for that matter. We can only stipulate their speed by choice of a particular convention. Einstein used the same word 'stipulate' (in German of course) when describing this situation.

However, John Winnie in 1970 was able to develop the equivalent equations of SR without specifying a choice.²⁰ By parametrizing all choices of the one-way speed with the Reichenbach parameter ϵ Winnie was able to formulate the SR equations in the most general case. Those could be used in the most general way to show that all allowed choices of the Reichenbach parameter ϵ ($0 < \epsilon < 1$) produced the exact same physical results—results that can be measured in an experiment. Einstein had chosen an isotropic speed where $\epsilon = \frac{1}{2}$, but all other choices where $\epsilon \neq \frac{1}{2}$ produce the same physically measureable outcomes.

Experiments change our thinking

What causes a change in our way of interpreting the evidence? It is usually new evidence by way of some measurements, or failure of some measurement as was the case

of the Michelson-Morley effort to detect the aether. The latter was then consistent with Einstein's constant speed of light postulate mentioned above. If an aether was detectable it would mean the motion of the observer (on Earth) has an effect on the measured speed of light. That non-detection changed the way of thinking, via Einstein, as counterintuitive as it was and still is.

Had we not had the experimental evidence like in Young's double-slit experiment no one would have believed the predictive power that quantum mechanics can offer, as counterintuitive as it may seem to be. The experiments are robust, and the quantum theory correctly predicts outcomes of those experiments, but it is the *interpretation* of the experimental evidence that is still debated. How do you explain the collapse of the wave function of a pair of entangled states,²¹ which appears to be instantaneous action at a distance? This has been experimentally demonstrated, but there is no consensus on the underlying interpretation.

The same is the case here. We have definitive experimental evidence, i.e. the round-trip measurement of the speed of light, but no method of measuring the one-way speed of light. All such experiments have failed. However, the interpretation involving the conventionality thesis is still argued over. Some claim it is conventional and some claim it is empirical. It can't be both.

Conclusion

I do agree that ASC seems to be counterintuitive. It even seems bizarre. But Special Relativity is bizarre, with observer-dependent time dilation of clocks and length contraction of rods. Even the light postulate²² itself is bizarre.

Perhaps we think this way because we are conditioned to believe in symmetry and homogeneity. We think this is how the universe ought to be. But we have no basis to believe that. We have no basis to assume the one-way speed of light is isotropic, and that it has some intrinsic value.

If there is one thing that empirical science has taught us, it is that unless an experiment has disproven our theory we can continue to apply it, and test it. If we could measure the one-way speed of light, or calibrate clocks separated by a distance, we would have an experiment forcing a conclusion on us. But we don't.

Philosophy is intrinsically tied to any measurement we make. It involves the starting axioms we postulate. We cannot make a measurement of time or length without first assuming axioms. In this case, one assumption (axiom) involves the one-way speed of light. If you assume it is isotropic—the standard Einstein convention—then you have what most people assume (incorrectly) to be some sort of absolute truth in the universe. It is often difficult for them to believe

otherwise. It is a bias, and not based on any measurement. It is merely assumed to be true.

In over 110 years, since Einstein's 1905 paper, no one has successfully devised a thought experiment or an actual empirical measurement that could measure the one-way speed of light without assumption(s) on the synchrony of clocks separated by a distance. Many have been suggested, but others have subsequently showed the flaw in the design. Usually the flaw involves the implicit assumption (the *petitio principia*²³) that the speed of light is isotropic. However, if one such experiment were to be successfully demonstrated, it would disprove the conventionality thesis. So far this has not happened.

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6. Jammer, ref. 3, introductory page.
7. The problem is even bigger because to know the distance you also need to know the time on the distant clock. Ultimately a distance measurement is a measurement of time on a pair of synchronized clocks at each end of the distance to be measured.
8. Also called the Einstein Synchrony Convention (ESC).
9. I sought for relativistic solutions that used time dilation to solve the problem.
10. Genesis 1:14–15; Psalm 33:9; 2 Peter 3:7.
11. Jammer, ref. 3, p. 300.
12. The debate is even much more uncertain when it comes to general relativity, where gravity is added. It is even more uncertain in quantum mechanics where any concept of relative clock synchrony seems to be elusive. Newtonian absolute simultaneity seems to be more compatible with that theory, which includes faster-than-light action at a distance from the collapse of the wave function with entangled pairs of quantum states.
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21. Consider a pair of entangled photons. Since they are entangled, by definition, there is only one wave function between them. One wave function describes both particles simultaneously. If you do something to one particle that alters the wave function, for the other particle since they share the same wave function, regardless of their separation in distance.
22. Principle (2) above.
23. A fallacy in which a conclusion is taken for granted in the premise; begging the question (different from the way the layman often uses the latter phrase).

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Thomas Malthus's influence on the eugenics and abortion movements

Jerry Bergman

Thomas Malthus proposed human population growth would continue unchecked until it was eventually culled by the less fortunate members dying from famine and disease. Malthus believed that population growth would preclude long-term progress towards a better society because the earth's ability to produce food would be unable to keep up with the normal population growth.¹ Population checks, including poverty, misery, vice, crime, and starvation, would begin when the population level exceeded the land's ability to produce food. In developing their idea of evolution, both Darwin and Wallace exploited this proposal, concluding that the effect of Malthus was to cull the least fit. This would result in the survival of the most fit and evolution of the species.

Thomas Malthus (figure 1) is rated as one of the 100 most influential people of all time, partly due to his influence on several modern social movements.² For example, it “was from Malthus that Darwin derived the principle of Natural Selection, the central mechanism in his theory of evolution”.³ Malthus also inspired the population control movement, which was a major influence for both the birth-control and abortion movements.⁴ Thomas Malthus is widely known today mostly for his well-known book, *An Essay on the Principle of Population* (figure 2). Although first published in 1798, it is still in print, which indicates both its popularity and significance today.

His background

Thomas was the sixth of eight children of Daniel and Henrietta Malthus.⁵ Daniel Malthus, a friend of David Hume and Jean-Jacques Rousseau, was from a ‘good family’.⁶ In 1798, Thomas Malthus was appointed as Anglican country curate at Okewood, near Albury in Surrey.⁷ On 12 April 1804, Malthus married his cousin, Harriet, a marriage that produced three children. Also in 1804, he became Professor of History and Political Economy in Hertfordshire, Haileybury.⁸ His students affectionately referred to him as ‘Pop’ or ‘Population’ Malthus due to his focus on population theory.

An essay on the principle of population

Between 1798 and 1826, Malthus published six editions of his book, each subsequent update addressing more of the criticisms that arose against his theory. Malthus observed that a segment of every human population almost always ended up in poverty. If left unchecked, the human population tends to grow in a geometrical fashion (2,4,8,16), while food production increases only arithmetically (2,4,6,8,10 ...). This is clearly unsustainable, as the rapidly increasing population

size relative to the resources available subjects the “lower classes to poverty, which causes disease and premature death”.⁹

Furthermore, the poor will then be forced to live in much worse conditions, many of them reduced to abject poverty.¹⁰ Malthus also observed that societies throughout history have experienced epidemics of disease, crop failures leading to localized famines, and wars, all events which have reduced the population while masking the fundamental problem of populations overstretching limited resources.

Malthus's ideas rapidly became hugely influential in economic, political, social, and even scientific thought, despite it being obvious that his writings clearly strongly argued against the popular 18th-century European view that humans have an almost limitless ability to improve society.¹¹

Proposed solutions

Malthus argued that two types of checks can hold a population to within its resource limits. The first were *negative checks*, which included famine, disease, and war. The second were *preventive checks*, including birth control, abortion, and celibacy. The application of population control, as later proposed by Francis Galton, called ‘eugenics’, was necessary to produce improvements in the average size and strength of humanity by forcing the less fit into a life of celibacy.¹²

As a Christian clergyman, Malthus put more emphasis on positive eugenics, such as marriage postponement until the couple could support a family. This, he felt, “coupled with sexual abstinence ... was the best means ... of easing the poverty of the lower classes”.¹³ Malthus also addressed the question of how an omnipotent and caring God could allow all the suffering he saw all around him. He concluded that humans were solely to blame for human suffering, writing:

“... it is the intention of the Creator that the earth



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Figure 1. A formal portrait of Thomas Robert Malthus

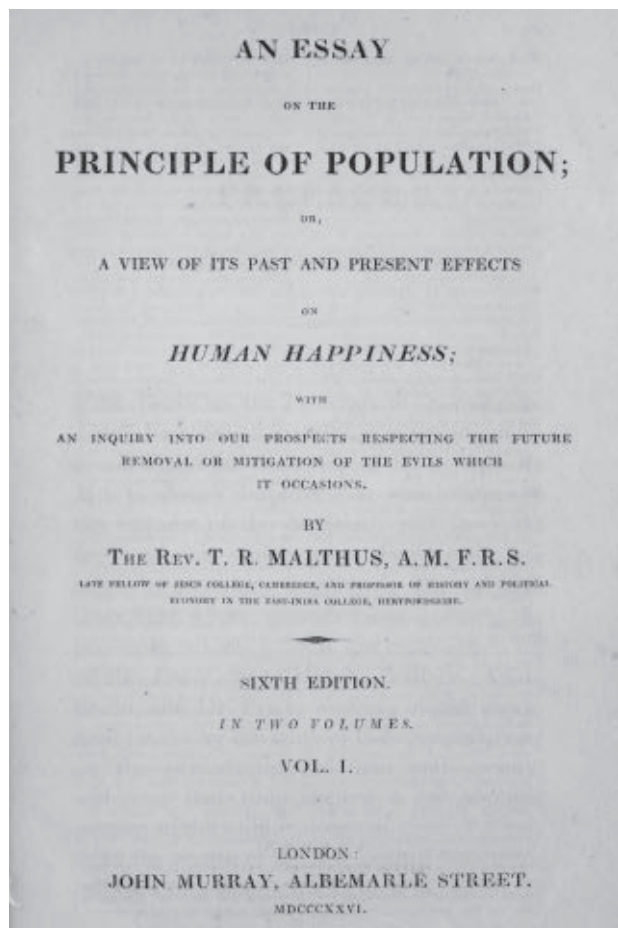


Figure 2. The cover of the 6th edition of Malthus's *An Essay on the Principle of Population*

should be replenished ... with a healthy, virtuous and happy population, not an unhealthy, vicious and miserable one. And if, in endeavouring to obey the command to increase and multiply, we people it only with beings of this latter description and suffer accordingly, we have no right to impeach the justice of the command, but our irrational mode of executing it.”¹⁴

‘Preventive checks’, such as limiting birthrates, by such means as birth control and abortion, were later used as population controls by several Western nations. It was believed such checks could ensure a higher standard of living for all, while concurrently increasing economic stability.⁴

In Malthus’s day, many observers regarded high fertility as an economic advantage because it increased the number of workers. Malthus, however, convinced most economists that, even though high fertility might increase the gross economic output, it tended to reduce the per capita output. In 1823, Malthus contributed an article on population in the *Encyclopædia Britannica* supporting his view.

Darwin exploits Malthus

When attempting to solve the origin of species problem, Darwin read widely including, in 1838, Thomas Malthus’s *Essay on the Principle of Population*. Charles Darwin openly acknowledged the central role that Malthus played in the development of his own ideas about biological evolution. Darwin even referred to Malthus as “that great philosopher”.^{15,16} Darwin added: “... it at once struck me that under these circumstances favorable variations would tend to be preserved, and unfavorable ones ... destroyed. The result of this would be the formation of new species.”¹⁷ Thus, Malthus’s writings were clearly the primary source of Darwin’s conclusion that the single most important contribution to evolution was the doctrine of the survival of the fittest by natural selection.

Although Darwin even felt Malthus explained the origin of all species, he recognized that the application of Malthus’s remedy, namely *preventive checks*, would actually work against evolution.¹⁸ Darwin ignored Malthus’s humanitarian response to the problem and, instead, saw the ruthless, brutal survival-of-the-fittest force as the dominant contributor to evolution. He taught that for creatures to evolve, biologically inferior animals must be selected out by ‘red in tooth and claw’ natural selection, leaving the superior animals to take over the earth.

Darwin’s theory, then, is actually Malthus’s theory, slightly modified.¹⁹ Specifically, Darwin altered Malthus’s thesis from the poor and less fortunate dying off due to overpopulation to the biologically inferior dying off as a result of being unable to compete against the more fit life forms.²⁰ Darwin called his process *natural selection* to differentiate it from the artificial selection process that humans use to modify animals

for human goals. He also believed that the solution Malthus stressed would not work because “the doctrine of Malthus, applied with manifold force to the animal and vegetable kingdoms, [would fail because] ... there can be no artificial increase of food, and no prudential restraint from marriage”.¹⁸

Darwin realized that the end result of Malthus’s *negative checks* would be the formation of new plant and animal species; thus was born his ‘species theory’, which “would grow and develop over the next few years. He quickly drew the analogy between the role of nature in shaping her species and the role of humans in shaping breeds”, a process we call animal breeding.²¹ A problem was that the Darwin–Wallace theory only explained the loss of characteristics and even whole species, and not the gain of *new* genetic information required to produce new species, a problem that neither Darwin nor anyone else since then has been able to solve.²²

Evolution’s co-discoverer, Alfred Russel Wallace, also acknowledged the importance of Malthus’s writings as being critical to his own evolution theory, noting that without it he probably would “not have hit upon the theory of Natural Selection”.²³ Wallace explained:

“... the most important book I read was Malthus’s *Principles of Population* It was the first great work I had yet read treating ... any of the problems of philosophical biology, and its main principles remained with me as a permanent possession, and twenty years later gave me the long-sought clue to the effective agent in the evolution of organic species.”²⁴

Malthus proven wrong

Even during Malthus’s lifetime, the many major problems with his theory soon became obvious:

“... what economists now call the ‘Malthusian Trap’—that as population rose, personal income levels decreased. This was true in England, but only until about 1800. When Malthus wrote his *Essay on Population* in 1798, real wages had been stagnant or declining for generations But after 1800 the facts told a different story. By the ... early 1830s ... personal income was increasing even as the population grew.”²⁵

The reasons geometric population growth in the 20th century did not result in a Malthusian catastrophe, as Malthus had expected, included that greater labour specialization and capital investment in mechanical equipment had resulted in major improvements in agriculture production. Other improvements included the use of fertilizers and petrochemical pesticides to control crop pests, mechanization (tractors and combines), and the introduction of high-yield farm crop varieties. Humans have also learned to generate electrical and mechanical power from fossil fuels and other sources to pump water for irrigation.

One of the most critical agriculture innovations was Justus von Liebig’s 1840s discovery that nitrogen was a central factor in plant growth. Liebig learned how to synthesize the bio-available form of nitrogen called nitrate, and began the fertilizer revolution.²⁶

The second critical development that negated Malthus’s thesis occurred in the early 1900s when chemist Fritz Haber developed a process to synthesize fertilizer by using high temperatures to combine hydrogen derived from methane with atmospheric nitrogen.²⁷ The energy-intensive Haber-Bosch process is now used throughout the world to fixate atmospheric nitrogen to produce low-cost artificial fertilizers. All of these developments have now largely negated Malthus’s major thesis.

As a result, the seemingly common-sense Malthusian premise has been falsified. Zubrin, in a chapter titled ‘The data that proves Malthus wrong’, reviews world population growth data plotted against GDP per capita growth, documenting how crop production has historically outstripped population growth. The data also show:

“... with the right political and social conditions, men’s inventiveness, creativity, collaboration and innovation actually accelerate the production of food and other resources as population increases, rather than deplete them Food production in the past few decades has grown exponentially and ... new technologies have replaced the need for scarce or outdated resources.”²⁸

Both the hawk and man eat chickens; the more hawks, the fewer the chickens, but more men usually means *more* chickens.²⁹ Scientists who regarded Malthus as a failed prophet include the late editor of *Nature* John Maddox.³⁰

For the reasons noted above, the food situation has actually improved significantly since Malthus. Despite the world population doubling between 1960 and 2000, calories produced per day, per capita, has globally increased by 23% during this same period.³¹ Furthermore, as any restaurant worker knows, about half of all food grown today is wasted; reasons for this include high crop yields, government programs for price control, and general wastage due to poor handling and storage. If the waste were reduced, the earth could easily support a much larger population than exists today.

Another factor is that, in many areas, including Europe, Japan, Canada, and the United States, the birth rate is now significantly below replacement level, which is about 2.1 children per family. Some nations now actually use financial incentives to encourage families to have more children in order to help maintain or increase their population levels. Because these programs have had very limited success, immigration now appears to be the only way that many countries can maintain their current population levels.

The harmful results of Malthus's and Darwin's theories

Malthus's idea also became the intellectual basis of natural selection, not only for both Charles Darwin and Alfred Russel Wallace, but also for Herbert Spencer, who coined the term 'survival of the fittest' and birthed modern ecological-evolutionary social theory.^{32,16} Historians today call Malthus "the most dismal scientist" because his doctrine "served to rationalize the starving of millions" of people for what was believed to be the good of humanity as a whole.³³

Darwin's theory argued, as did Malthus's for humans, that most animals produced more young than the environment could support. Consequently, they had to struggle with each other in order to survive. This 'struggle for existence' resulted in those life-forms best adapted to their environment surviving, while others perished. If certain characteristics allowed the animal to be able to survive to reproduce, these characteristics would be passed on to its descendants and by this means new species would gradually be formed.³⁴

Believing that basic human nature could not be changed, Malthus wrote: "the actual population [is] kept equal to the means of subsistence by misery and vice".¹ Individual decisions regarding sex, children, and work determine the population's expansion, an idea that inspired the abortion movement, as well as government regulation of the population, such as in communist countries.³⁵

Among the many scientists who disagreed with Malthus was evolutionist Ronald Fisher who was skeptical of using Malthusianism as a basis for natural selection.³⁶ Fisher did not deny Malthus's basic premises, but emphasized the importance of the role of controlling fecundity in solving the problem.³⁷ Furthermore, Professor Beth Houston wrote:

"But Darwin, like Malthus, was wrong in assuming that populations always outpace resources. Researchers have found that populations are held in check not by starvation, disease, or predation but by intrinsic forces; there is no overarching 'struggle for existence', no natural selection that preserves the strong and destroys the weak. This doesn't mean that there is no struggle, only that some cosmic fundamental struggle is not the core motivation for life; life is not created and sustained by a struggle for food. Even in times of catastrophe, such as extreme drought, species survive by adapting or moving on, and geneticists now know that the ability to do either is already preprogrammed in the species."³⁸

George Washington University Anthropologist Eric Ross depicted Malthus's work as a major rationalization not only for the eugenics and abortion movements, but also for the social inequities produced by both the Industrial Revolution and the anti-immigration movement.³⁹ Malthus's theory implied that if the population continued to grow unhindered doom for humans would result, providing justification for human

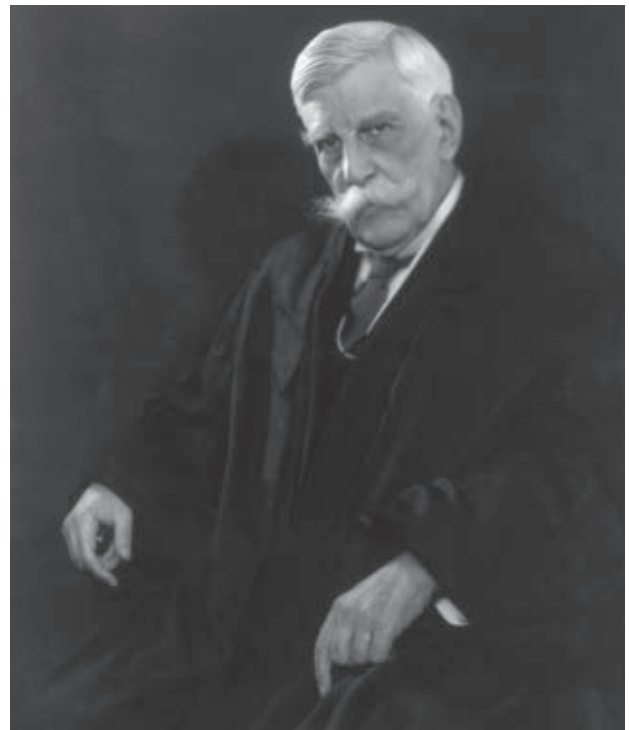


Figure 3. Oliver Wendell Holmes, Jr., The author of the now infamous *Buck vs Bell* Decision that opened the floodgates to the eugenics movement in the United States and the rest of the world. Formal photograph taken around 1930.

oppression and tyranny, and widespread use of abortion such as in China and Russia.⁴⁰

Far from being the result of overpopulation, historians claim that events such as the 1846 Irish famine and the massive starvation in India in the late 1800s were more of a result of attempts to apply Malthus's doctrine to control people than the results of the potato disease and drought, respectively, that are normally claimed to have caused these human tragedies.⁴¹

Malthus also had a critical influence on Supreme Court Judge Oliver Wendell Holmes (figure 3), who in the *Buck vs Bell* Supreme Court case allowed eugenic sterilization of those persons whom the eugenic supporters determined were inferior people. In 1914 Holmes purchased a copy

"... of a new edition of Thomas Malthus's *An Essay on the Principle of Population*. Holmes was thoroughly won over by the book's bleak vision of the future, in which human population outstripped the food supply. In a letter to his friend Frederick Pollock, Holmes wrote, 'Malthus pleased me immensely—and left me sad' ... Holmes said, 'that politicians and labor leaders still live on'. Holmes would later declare himself a 'devout Malthusian'. Malthus appealed to Holmes's cynical, misanthropic side. He later explained to a friend, 'I look at men through Malthus's glasses—as like flies—here

swept away by a pestilence—there multiplying unduly and paying for it.”⁴²

In 1915, Holmes made his most direct plea for eugenics, in an essay in the *Illinois Law Review* titled ‘Ideals and Doubts’. The way to achieve the “wholesale social regeneration” that forward-looking people wanted, he argued, was not through “tinkering with the institution of property”—as the communists were urging—but “only by taking in hand life and trying to build a race”.⁴³

He concluded that building a superior race involved applying Darwin to society. In fact, “Malthus’s predictions of a struggle for survival by cataclysm could not have been less accurate”.⁴⁴ We now know that “instead of blind struggle, there was ingenuity; instead of selfish grab, there was co-operation; with an increase in population, there actually followed an increase in food” due to better farming techniques and new hybrids.⁴⁵

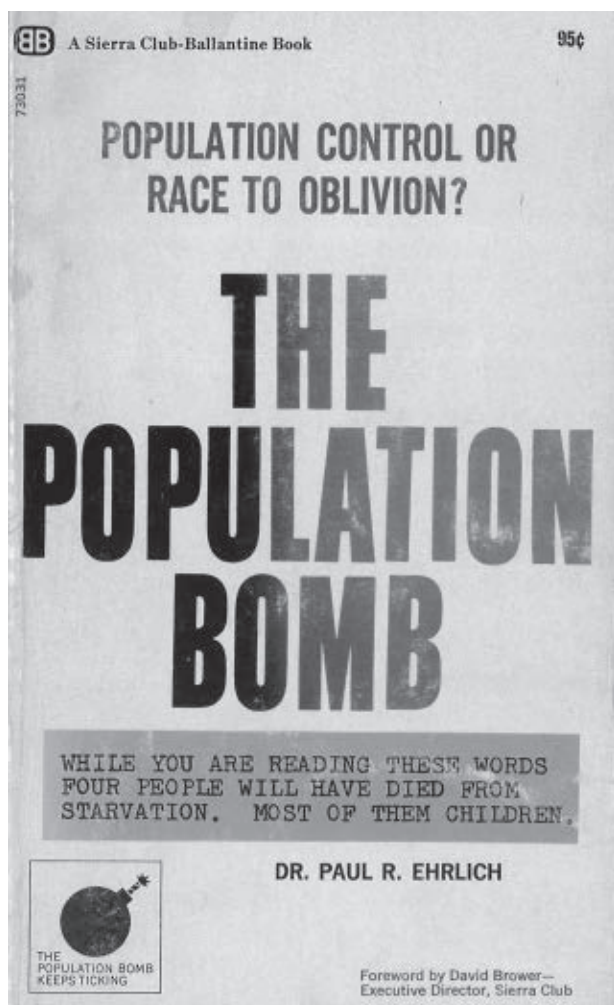


Figure 4. Cover of the bestselling book *The Population Bomb*. Based on Malthus’s prediction, Paul Ehrlich wrongly envisioned an ensuing worldwide calamity. The book is an embarrassment today.

His influence today

Although Malthusian ideas continue to influence scholars today, his theory has continued to fail for several reasons. Stanford University Professor Paul Ehrlich, inspired by Malthus, penned several books in the late 1960s predicting hundreds of millions of persons would die from the overpopulation crisis that he and other leading biologists expected to occur in the 1970s unless birth control and abortion were widely utilized by the population.⁴⁶

Ehrlich envisioned that the horrific future awaiting humanity included the starvation of millions, or even billions, of people. His numerous best-selling books (many coauthored with his wife Anne Ehrlich) documenting this dire future included *The Population Bomb* (1968; figure 4); *Population, Resources, Environment: Issues in Human Ecology* (1970); *The End of Affluence* (1974); and *The Population Explosion* (1990).⁴⁷ All of his predictions have now failed and his work “has been proven spectacularly wrong.”⁴⁸ The *New York Times* summarized his failure as follows:

“No one was more influential—or more terrifying, some would say—than Paul R. Ehrlich, a Stanford University biologist. His 1968 book, ‘The Population Bomb’, sold in the millions with a jeremiad that humankind stood on the brink of apocalypse because there were simply too many of us. Dr Ehrlich’s opening statement was the verbal equivalent of a punch to the gut: ‘The battle to feed all of humanity is over.’”⁴⁹

Journalist Haberman added that Ehrlich also forecast

“... that hundreds of millions would starve to death in the 1970s, that 65 million of them would be Americans, that crowded India was essentially doomed, that odds were fair ‘England will not exist in the year 2000’. Dr Ehrlich was so sure of himself that he warned in 1970 that ‘sometime in the next 15 years, the end will come’. By ‘the end’, he meant ‘an utter breakdown of the capacity of the planet to support humanity’.”⁴⁹

The first Director-General of UNESCO, Julian Huxley, in his 1964 book *Evolutionary Humanism*, called for a radical government-enforced world population control policy. Both Huxley and Ehrlich openly encouraged use of birth control and abortion to control the population. They also openly opposed the Roman Catholic opposition to birth control and abortion, as well as the church’s opposition to strict government-enforced population control.

Other examples of applied Malthusianism include the 1972 book *The Limits to Growth*, published by the Club of Rome, and the ‘Global 2000’ report completed for the then President of the United States, Jimmy Carter. Reflecting the works of both Charles Darwin and Robert Malthus, both Professor Paul Ehrlich and science-fiction author Isaac Asimov also issued many appeals for government-mandated, forced population control.

Conclusion

Darwin and Wallace relied heavily on the ideas of Thomas Malthus, which have proven to be misguided, especially in the last century. Nonetheless, the widespread adoption of these ideas has led to moral problems such as the Malthus-inspired eugenic movement in the United States, Nazi Germany, Sweden, and other nations, as well as the widespread support for abortion.

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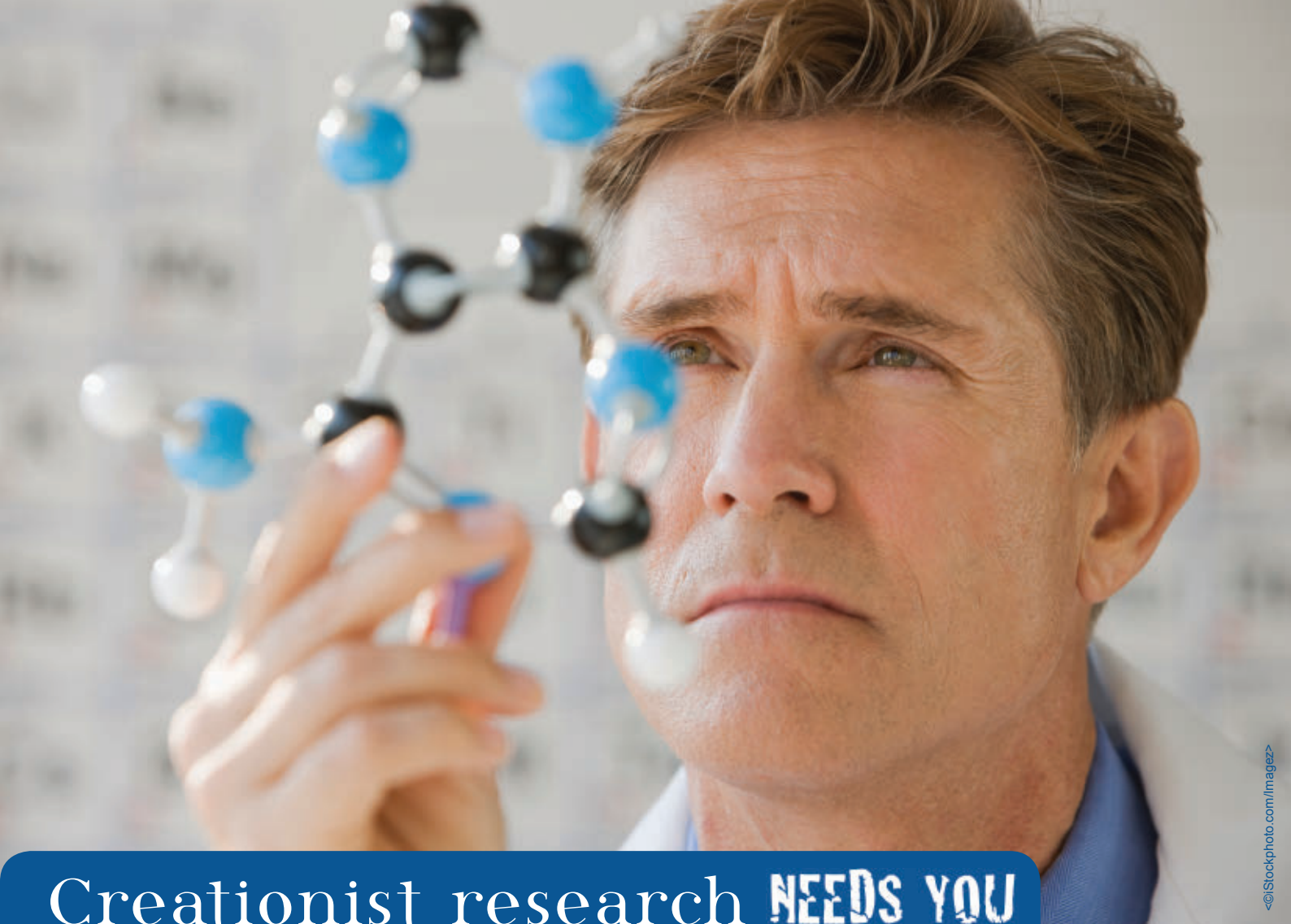
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